Focused Feasibility Study
Lead-Impacted Soil Remediation

L.E. Carpenter & Company
Wharton, New Jersey

USEPA ID No. NJD002168748

February 2003

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Executive Summary

RMT, Inc. (RMT) prepared this Focused Feasibility Study (FFS) regarding the Wharton, New Jersey Superfund site (USEPA ID No. NJD002168748) on behalf of L.E. Carpenter & Company (LEC). The objective of this FFS is to provide the required documentation to the New Jersey Department of Environmental Protection (NJDEP) and the United States Environmental Protection Agency (USEPA) to support modifying the approved 1994 Record of Decision (ROD) regarding the approved remedial alternative for lead impacted site soils.

The 1994 ROD specified spot excavation and off-site disposal of soils containing lead exceeding the ROD cleanup criteria of 600 mg/kg, which is protective of human health given an industrial land-use scenario (Ref. 1994 ROD pg. 2). More recent investigations have shown that soils with lead concentrations above the cleanup criteria are much more extensive than previously believed, which led to the conceptualization of an alternative for addressing these soils consisting of on-site beneficial re-use of lead-impacted soils. This FFS provides an evaluation of this alternative to address on-site soils with elevated concentrations of lead, and provides a technical comparison between the original ROD approved alternative and the proposed alternative in terms of efficacy, environmental risk, and cost as required by Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

A large fraction of the lead-impacted soils overlie a zone of free-product impacted soils, and therefore removal of the free-product source cannot be addressed without first excavating the majority of the lead-impacted soils. Because the ROD specified removal of the immiscible free-product source as Phase I of the groundwater remediation, and NJDEP believes that efforts to date (*i.e.*, passive and active skimming, pneumatic pumping system, and enhanced fluid recovery or EFR) have been too time-consuming and of limited effect, LEC has presented and received general approval on a conceptual free-product remedial strategy that is more robust than the currently used method of EFR via 28 extraction wells. This strategy involves excavation and off-site disposal of free-product impacted soils. Therefore, timely review and approval of this FFS, and subsequent ROD change is requested in order to most expeditiously achieve site cleanup.

LEC is opting for an end-use plan for the LEC Wharton property that involves predevelopment of the remediated site as an eventual municipal recreation area rather than for industrial reuse. This FFS therefore addresses the necessary reevaluation of human health and environmental risks presented under this revised end-use scenario.

Although we believe that a reasonable human exposure scenario for the planned end use compared to an industrial use results in less exposure time for sensitive population segments, **LEC has opted to use the USEPA and NJDEP residential remedial action goal of 400 mg/kg for lead in soils as the criterion for protection of human health.**

An earlier ecological risk assessment (*Rockaway River Sediment Ecological Assessment Report;* WESTON, 1992) evaluated the potential impacts to that portion of the Rockaway River abreast of the LEC facility. NJDEP and USEPA agreed with the conclusion of the ecological risk assessment that historical operations associated with the facility did not pose an unacceptable risk to the environment (NJDEP, February 1993). The 1992 assessment was performed by evaluating existing habitat under conditions consisting of soils with elevated lead concentrations exposed at the ground surface. Because the alternative recommended herein calls for clean soil cover on top of soils with elevated lead, implementing the alternative will continue to pose no risk to the environment, and will in fact also result in no further exposure via surface runoff and erosion to any Rockaway River, transient area, and wetland habitat.

Additional evaluations presented in this FFS show that the clean soil cover proposed for those portions of the facility with lead concentrations greater than 400 mg/kg will also prevent direct exposures for other potential and known ecological receptors. The quality of the habitat for these portions of the facility is such that it is not expected that a significant number and variety of species will inhabit these areas (the 100-year floodplain and the river-bottom/wetland habitat are all located outside the area where lead-soils will be re-buried). Likewise, the depth of the proposed capping system under Alternative 2 will be such that exposure to any potential burrowing species of significance is not expected.

Data also show that on-site soils with elevated concentrations of lead do not pose a risk to the groundwater. Specifically, a synthetic precipitation leaching procedure (SPLP) performed on soils with elevated lead demonstrated that potential impacts to groundwater were less than New Jersey groundwater quality criteria (RMT, 2002). In addition, groundwater tests show that no lead is currently detectable above drinking water cleanup criteria immediately downgradient from the lead-impacted soils. Because on-site reburial will result in placement of the soils of concern above the highest recorded water table, and below a minimum of two feet of clean fill, the alternative will not result in an increased potential for mobilization of lead into the shallow aquifer.

Based on our risk assessment analyses and chemical and hydrogeological data evaluations, the greater costs for off-site disposal do not provide any additional benefits in terms of risk-reduction regarding the environment and public health. Therefore LEC requests that NJDEP and USEPA approve Alternative 2 (excavation and on-site beneficial reuse as sub-grade fill material) and move forward as rapidly as possible with the necessary ROD modification.

Section 1
Introduction

1.1 Objective

On behalf of L.E. Carpenter & Company (LEC), RMT, Inc. (RMT) is presenting this Focused Feasibility Study (FFS) for the Wharton, New Jersey Superfund site (USEPA ID No. NJD002168748) as required by the New Jersey Department of Environmental Protection (NJDEP) and United States Environmental Protection Agency (USEPA) letter dated January 22, 2003. As outlined in the 1994 Record of Decision (ROD), on-site soils exhibiting lead concentrations in excess of the 600-milligram per kilogram (mg/kg or ppm) cleanup criteria were slated for spot excavation and off-site disposal. Although some of these spot excavations were performed, verification sampling showed that soils with elevated concentrations of total lead were much more voluminous than previously thought. Most of the excavated soils were stockpiled on-site pending completion of additional investigation and delineation efforts. Following completion of the lead delineation report (RMT, March 2002), it became apparent that an alternative to off-site disposal would likely be equivalent in terms of protecting public health and the environment, but at a significantly lower cost. The objective of this FFS is to provide the required documentation to the NJDEP and USEPA to support a change to the ROD-approved remedial alternative for lead-impacted soils from excavation and off-site disposal to excavation and on-site beneficial reuse as subgrade fill material.

1.2 Site Location

The LEC site is located at 170 North Main St., Borough of Wharton, Morris County, New Jersey (Figure 1). The site comprises Block 301, Lot 1 and Block 703, Lot 30 on the tax map of the Borough of Wharton, and occupies 14.6 acres in a mixed-use industrial, commercial and residential area. The site is bordered to the south by the Rockaway River; by a vacant lot (Wharton Enterprises) to the southeast; and by a compressed gas facility (Air Products) to the northeast. A residential area borders the site to the northwest and the Washington Forge Pond borders the site to the west. A drainage ditch is located between the Air Products site and the LEC site. A pedestrian foot trail (rails-to-trails area), constructed along the former railroad right-of-way, bisects the site from north to south. During active LEC operations, the site consisted of several buildings and structures, some of which were partially demolished during the early 1990s as part of site decommissioning activities. Figure 2 is a map of the general site plan that depicts individual buildings present or formerly present at the site, and pertinent site features.

1.3 Site Operational History

The site's operational history has been summarized in numerous reports including, but not limited to, the 1992 Final Supplemental Remedial Investigation Addendum Report (Weston, 1992a), the Evaluation of Remediation of Groundwater by Natural Attenuation Report (RMT, 2000a), the agency approved workplan for Further Off-Site Groundwater Investigation at MW-19/Hot Spot 1 (RMT, 2000b), and is summarized briefly here. As outlined below, historical operations have been subdivided into two categories (1) mining and forging, and (2) vinyl manufacturing. Both historical operations have been presented in the context of this FFS, as both have historically been reported to contribute to the potential source of lead contamination in on-site soils.

1.3.1 Mining and Forging Operations

Morris County and the Wharton area has been an iron mining district since the early 1700s. The earliest known use of the site was as an iron forge, termed the "Washington Forge." The Washington Forge was built in about 1795 and probably used hand-cobbed iron ore from surficial deposits in and around the Wharton area. Economically viable iron deposits were discovered at the site, and subsequently site operations changed from forging to underground iron mining. According to a New Jersey Department of Labor publication (NJDOL, 1989), the Washington Forge Mine and West Mount Pleasant Mine are located "in the LEC lot." The NJDOL report states that the Washington Forge Mine opened in 1868 with the construction of two inclined shafts 20 feet apart on the grounds of the old forge.

The mine was worked until 1875 when it was closed because of the difficulty in handling groundwater seepage into the mine (Bayley, 1910). The mine reportedly opened again in 1879 after a drainage tunnel to the Orchard mine was completed. The Orchard mine was located south across the Rockaway River from the LEC site. The Washington Forge mine was permanently abandoned in 1881. The West Mt. Pleasant Mine connects with the Washington Forge Mine with an inclined access shaft located about 170 feet northeast of the southern-most Washington Forge mineshaft.

RMT superimposed the location of the mines on an LEC site map based on a United States Geological Survey map contained in the "Geology and Magnetite Deposits of Dover District, Morris County, New Jersey" (Sims, 1958). This LEC site map showing approximate mine locations is presented as Figure 2 in the report entitled *Revised Workplan for Delineating and Characterizing Elevated Lead Concentrations in Soil* (RMT, May 2001c). Although there are some minor discrepancies in terms of the exact location, all sources show the inclined-shaft mine entrances were located between the railroad tracks and North Main Street. The iron forge and mining history above shows that transportation of iron ores from various locations in Morris County onto the LEC property occurred over a period of at least 86 years (1795–1881).

1.3.2 Vinyl Manufacturing

The LEC facility was involved in the production of Victrix vinyl wall coverings from 1943 to 1987. The making of vinyl wall coverings involves several manufacturing processes that were carried out in the various buildings on the site. The first step in the process is referred to as lamination. Lamination involves the bonding of fabric to the vinyl film using a plastisol adhesive in conjunction with heat and pressure. The fabric/film laminate is then coated with a plastisol compound in order to texturize the material in preparation for printing. The printing process involves the application of decorative print patterns and/or protective topcoat finishes. When printing is completed, the product is inspected and packaged for shipment to the consumer.

The manufacturing process involved the generation of liquid waste solvents including xylene and methyl ethyl ketone, waste pigments, and the generation of condensate from fume condensers. Additionally, airborne particulate matter was collected via a dust collector. Non-contact cooling water was discharged into the Rockaway River under a New Jersey Pollution Discharge Elimination System Permit. From 1963 until 1970 LEC disposed of its wastes, including a polyvinyl chloride (PVC) waste material into an unlined on-site impoundment.

The active manufacturing of vinyl wall coverings ceased in 1987. Since that time the portion of the site east of the pedestrian trail (former railroad crossing) has been inactive except for remedial and monitoring activities. Access is currently restricted to the area east of the pedestrian trail by a locked gate and an 8-foot high chain-link fence. The buildings west of the pedestrian trail have been subleased as a warehouse space and manufacturing operations.

1.4 RI/FS and the 1994 Record of Decision (ROD)

The initial environmental investigations at the site were performed in response to sampling activities performed by the NJDEP in 1980 and 1981. These activities resulted in LEC entering into an Administrative Consent Order (ACO) in 1982. The site was added to the National Priorities List (Superfund) in 1985. The 1982 ACO was superseded by an additional ACO in 1986, which required LEC to initiate a remedial investigation and a feasibility study (RI/FS).

RI/FS investigations were performed on behalf of LEC by Roy F. Weston, Inc. (WESTON) and GeoEngineering from 1986 to 1992, resulting in the generation of the following documents:

- *Report of Revised Remedial Investigation Findings, Volume 1* (GeoEngineering and Roy F. Weston, June 1990).
- *Supplemental Remedial Investigation* (Roy F. Weston, November 1990).
- *Final Technical Report For Tank Removal Operations* (Weston Services, Inc., September 1991).
- *Final Supplemental Remedial Investigation Addendum Report* (Roy F. Weston, September 1992).
- *Baseline Risk Assessment* (Roy F. Weston, January 1992).

In April 1994 NJDEP issued a Superfund ROD for the LEC site. The ROD summarizes the results of the remedial investigation (RI), the baseline risk assessment, and outlined feasible remedial alternatives. The selected remedy for the site is termed "Ground Water Treatment with Reinfiltration /Soil Bioremediation – ROD Alternative No. 4" and includes the following components:

- Floating product/groundwater extraction system installation and operation
- Remediation via biological treatment of extracted ground water
- Excavation and consolidation of bis (2-ethylhexyl) phthalate (DEHP) contaminated soils into a soil treatment zone
- Reinfiltration of a portion of treated groundwater (with added oxygen and nutrients) into the unsaturated soil treatment zone via perforated piping to allow *in situ* bioremediation of contaminated soils
- Recirculation of a larger portion of the treated groundwater within the capture zone.
- Remaining treated ground water to be discharged into a deeper aquifer in accordance with groundwater discharge criteria
- Provide vegetative soil cover for the area of the groundwater infiltration system
- Spot excavation and disposal of soils containing Polychlorinated biphenols (PCBs), lead and antimony, where levels exceed the soil cleanup levels in locations other than the east soils area designated as the disposal area
- Excavation of disposal area sludges/fill, which may inhibit *in situ* treatment.
- Environmental use restrictions on property

As noted above, spot excavation and off-site disposal of soils containing lead exceeding the ROD cleanup criteria of 600 mg/kg was required (Ref. 1994 ROD pg. 2).

Section 2
Historical Site Investigations and Remedial Actions

2.1 Identification of Impacted-Soil Areas

As outlined in the document entitled *Workplan for Phase I ROD Implementation* (Roy F. Weston, October 1994), a total of eleven (11) "Hot Spots," were identified during the RI/FS process as areas exhibiting either inorganic or organic contaminant concentrations in soil in excess of ROD cleanup criteria. Of the 11 hot spots identified in the RI/FS and excavated as part of Phase I Remedial Actions, 8 were located on the eastern half of the site in the vicinity of former Building 14 (Figure 3). Four of these (Hotspots B, C, D, and E) were identified as hotspots associated with lead-impacted soils. Hotspots 3, 4, 5 and 6 were associated with soils impacted by organic compounds.

In addition, the RI identified a zone of free product existing on the eastern side of the site as the major source of dissolved phase shallow groundwater contamination. The most recent data showing the extent of free product on-site is presented in Figure 3 of the report entitled *Quarterly Monitoring Report – 4th Quarter 2002* (RMT, January 2003).

This remainder of section will focus on those areas where lead was identified as the contaminant of concern in soil. In addition, this section will also summarize the investigations and results regarding the on-site free product zone. The free product issue has been summarized in the context of this lead soil FFS, because the proposed remedial strategy for both lead soils and the free product are interrelated. Refer to Section 4 of this report for a more detailed synopsis of the relationship between the lead soil and free product remedial approaches.

2.2 Lead-Impacted Soil

2.2.1 Initial Lead-Impacted Soil Hotspot Removal Actions

WESTON excavated soils from all of the inorganic hotspots shown on Figure 3 as part of Phase I ROD implementation activities initiated in 1994 and 1995. The details surrounding these activities are documented in the report entitled *Quarterly Monitoring Report – L. E. Carpenter Site* (Roy F. Weston, April 1995). Although RMT does not posses documentation regarding the final disposition of the soils WESTON removed from Hotspots A, B, C, and D, based on investigation work we have conducted on-site we believe that soil from most of these Hotspots were consolidated on top of the demolition debris associated with Building 14. After vibratory screening, the soils excavated from Hot Spot E [or the "Waste Disposal Area") were disposed of at LDW, Inc., Calvert City Kentucky (EPA ID No. KYD088438817). Hot Spots A and D excavations were completed during the 1st quarter of 1995 and clean post excavation samples were achieved at both hot spots. Subsequently the remediation of Hot Spots A and D is considered complete as the remedial action at each location met the requirements of the ROD. However, Hotspots B and C were only partially excavated due to continually high lead elevations noted in the confirmatory samples. The excavations for Hotspot B and C remain open to depths of approximately 3 to 4 feet.

2.2.2 Further Delineation of Hotspots B and C

Elevated lead concentrations in the confirmatory samples from the Hotspot B and C locations suggested that the lead contamination at the site was more widespread than previously anticipated. Correspondence between WESTON and NJDEP on behalf of LEC, entitled "Lead In Soil Data Compilation" (Roy F. Weston, December 1995) presents lead data gathered during the RI/FS process and data collected during the on-going remedial action field activities. This correspondence requested that NJDEP consider an alternative clean-up standard, including an Explanation of Significant Difference (ESD) and subsequent ROD change for lead soil contamination due to the larger than anticipated volume present at the site and the possibility that the source of lead may be related to historical mining activities at the site. NJDEP responded to this request by requiring that Hot Spots B and C be completely delineated for lead contamination in excess of the lead soil clean-up criteria.

WESTON performed additional soil excavation and sampling in May 1996 to determine the extent of lead-impacted soils at Hotspot B and C. The results of this sampling are presented in the *Second Quarter Progress Report* (Roy F. Weston, August 1996). This report concluded that the extent of lead contamination was much larger than originally anticipated in any of the previous reports. While these activities did add a greater understanding of the overall scope of the lead contamination at the site, that investigation did not completely delineate lead to the east, northeast, and southeast of Hot Spot B, or to the west, northwest and southwest of Hot Spot C.

2.2.3 Site-Wide Delineation of Lead-Impacted Soils

NJDEP responded to the results in the May 1996 WESTON investigation in January 1998 by acknowledging that the levels of lead may be indicative of background concentrations in the area. NJDEP and USEPA requested that a revised risk assessment and focused feasibility study be performed to support a capping option allowing soils with an acceptable risk level to be left in place.

RMT performed activities designed to delineate Hot Spots B and C and to address NJDEP and USEPA comments and requests for additional data. The results of this investigation are summarized in the *Hot Spot B and Hot Spot C Subsurface Lead Investigation* (RMT, August 1999). These activities also added a greater understanding of the overall extent of on-site lead contamination at the site, and detailed extent of lead in Hot Spots B and C. RMT concluded that the available data was sufficient for evaluating an alternative risk-based site-specific cleanup objective for lead, specifically soil capping.

NJDEP and USEPA responded to the results of this additional delineation report by requesting a new site wide delineation of lead focusing not only on Hot Spots B and C, but also on the entire site. NJDEP also requested that off-site background samples be collected if a background or mining related source for the lead was verified, in order to support any future requests to change the existing site-specific lead cleanup criterion of 600 mg/kg.

RMT outlined a scope of work in the document entitled *Revised Workplan for Delineating and Characterizing Elevated Lead Concentrations in Soil* (RMT, May 2001). The scope of work outlined in this workplan was specifically designed to (1) fully delineate the horizontal and vertical extent of lead concentrations in the soil and groundwater, (2) determine the potential source(s) of the elevated on-site lead concentrations, and (3) provide data necessary to fill data-gaps that may exist in the WESTON human health risk assessment. This scope of work was approved by NJDEP and USEPA in the NJDEP letter dated August 23, 2001, and subsequently implemented on-site between November 5 and 14, 2001. The results of this investigation were outlined in the document entitled *Nature and Extent of Lead in Soils and Groundwater - Volumes I & II* (RMT, March 2002).

2.2.4 Determination of Lead-Impacted Soil Extent, Nature and Source

The results of the November 2001 investigation showed that elevated lead concentrations are predominantly a result of historical manufacturing operations, and that lead occurs in two major forms within two distinct types of fill material:

- Lead associated with light- to brightly-colored process waste is likely from a release of potential vinyl stabilizer compounds such as lead phthalate or lead stearate.
- Lead associated with dark-colored forging and mining era fill material is likely from a release of potential vinyl pigmenting compounds, such as lead chromate.

The process waste (see Appendix A) exhibited lead concentrations ranging from 6,000 to 119,262 mg/kg (up to nearly 12%), and the dark-colored fill material has lead concentrations ranging from several-hundred to 2,700 mg/kg.

The leachability of lead from site soils was investigated by subjecting selected samples to testing via the Synthetic Precipitation Leaching Procedure (SPLP). A total of seven SPLP tests were performed on soil samples with elevated levels of lead. The results of the SPLP testing on the soil samples indicated that lead is generally not leachable in significant quantities from this material. The lead concentrations in the leachate generally ranged from 0.003 mg/L to 0.01 mg/L for lead, which are at or below the New Jersey groundwater quality standards for lead. Lead was not encountered in quantities above any action limit in site groundwater or in a sample of free product. The absence of lead in groundwater suggests that the groundwater ingestion pathway may be eliminated from consideration from any future risk assessment analyses.

The November 2001 investigation concluded that there is approximately 7,700 cubic yards (cy) of material (soils intermixed with debris, fill and aggregate material) on-site exhibiting concentrations of lead in excess of the 600-mg/kg ROD clean-up criteria. This includes the ID-27 debris generated as the result of Building 13 and 14 demolition activities, the 20,000 sq ft former Building 14 foundation slab, and the 5,000 sq ft concrete slab thought to exist within the former AST area, approximately 10 feet below ground surface (bgs). The original volume anticipated for excavation and disposal for hot spots B and C was 30 cy and 67 cy of soil respectively. The substantial increase in the volume of lead-impacted materials requiring excavation and off-site disposal represents a significant post-ROD change and is considered the major driver in the preparation of this FFS.

2.3 Free Product Investigations and Ongoing Remediation

As identified in the RI, primary dissolved phase contaminants of concern in the groundwater are ethylbenzene, xylenes, and bis (2-ethylhexyl) phthalate (DEHP). Based on the analytical results of historical free product sampling conducted by both WESTON and RMT, a zone of immiscible free and residual product in the site soils is considered the major source of dissolved-phase contaminants of concern in the shallow groundwater.

Immiscible product removal was identified in the 1994 ROD as Phase I of remediation for site groundwater, to be followed by Phase II, recovery and treatment of dissolved constituents in the groundwater, once the immiscible product was removed. Immiscible product recovery was initiated during the early 1990s, first with skimmer pumps in select wells, and then in 1997 with mobile enhanced fluid recovery (EFR) in 28 wells screened within the immiscible product zone.

The document entitled *Free Product Volume Analysis* (RMT, May 2000) concluded that a total volume of approximately 44,000 gallons of immiscible product existed in the source area east of the former rail spur that bisects the site, of which approximately 8,000 to 13,000 gallons were considered recoverable. As of 4th quarter 2002, site EFR activities have removed approximately 14,788 gallons of total fluids, of which, approximately 3,635 gallons were measurable free phase product. Based on historical modeling data, approximately 4,365 to 9,365 gallons of recoverable free product remains in the ground.

A conference call between RMT, LEC, the USEPA and NJDEP was held on October 25, 2001. During the discussions all four parties agreed that evaluating and implementing a more robust approach to managing the existing immiscible product should be expedited. The document entitled *Workplan To Evaluate Free Product Remedial Strategies* was prepared by RMT in November 2001 on behalf of LEC in response to the October 25, 2001 conference call, and receipt of the comment letter from EPA and NJDEP dated August 23, 2001 regarding the document entitled *Enhancement of Free Product Recovery* (RMT, May 2001). NJDEP comments were received via email regarding the November 2001 Workplan on November 20, 2001. Subsequently, the *Amendment to Workplan to Evaluate Free Product Remedial Strategies* (RMT, November 30, 2001) was submitted to the NJDEP addressing agency and department comments. Approval of both the Workplan and Amendment (the Workplan) was received from the NJDEP via email on December 7, 2001.

On December 10, 2001 RMT mobilized to the LEC site to conduct exploratory test pits and collected soil samples for physical and analytical laboratory analyses as outlined in the workplan. RMT installed a series of 19 test pits to evaluate soil excavatability and material variations, fluid properties (both shallow groundwater and free product), and contaminant concentration. The results of this investigation along with a conceptual remediation plan were outlined in the document entitled *Findings and Recommendations Regarding a Conceptual Free-Product Remediation Strategy* (RMT, March 2002). This investigation reached the following conclusions and presented the following recommendations.

- Soils encountered were very coarse grained but are excavatable.
- Installation of groundwater controls to aid in excavation of soils beneath the water table are not practical, due to the high hydraulic conductivity, large projected volumes of water that would have to be treated, and lack of a feasible treated groundwater disposal option.
- Excavation of soils beneath the water table will be performed without dewatering.
- Free-product impacted and water-saturated soils will be excavated in the wet and will be allowed to drain within the excavation (Ref. NJDEP Division of Solid Waste letter dated September 10, 2002).

- Screening of free-product impacted soils to separate the minus 3-inch fraction will be performed. Free product contaminated soils will be disposed off-site as a non-hazardous material (Ref. NJDEP Division of Solid Waste letter dated September 10, 2002).
- The plus 3-inch fraction will be re-used as backfill within the free product excavation.
- Recoverable free-product (liquid) and brightly colored process waste would be managed off-site as hazardous wastes.
- Stockpiling, and beneficial reuse within the free product excavation of (1) soils exhibiting lead concentrations greater than 600 mg/kg, and (2) upper layer soils and debris exhibiting lead concentrations less that 600 mg/kg (Ref. *Findings and Recommendations Regarding a Conceptual Free-Product Remediation Strategy*, Table 8, Material Categories A & C).

2.4 Regulatory Approval of the Conceptual Remedial Strategy

The NJDEP and USEPA provided comments on both the *Nature and Extent of Lead in Soils and Groundwater – Volumes I & II* (RMT, March 2002) and the *Findings and Recommendations Regarding a Conceptual Free-Product Remediation Strategy* (RMT, March 2002) in the NJDEP letter dated July 26, 2002.

In addition, during the period between February and September 2002, RMT on behalf of LEC, negotiated a reclassification of the liquid free product and subsequently the free product saturated soils enabling LEC to more cost effectively manage solid and liquid wastes anticipated to be generated during implementation of the conceptual remedial plan outlined in the *Findings and Recommendations Regarding a Conceptual Free-Product Remediation Strategy* (RMT, March 2002). RMT's approach to managing wastes generated during remedial activities is presented in the RMT letter dated February 11, 2002. NJDEP's approval of RMT's approach was presented in the NJDEP Division of Solid and Hazardous Waste letter dated September 10, 2002. The critical waste related issues approved by NJDEP allowing the effective and efficient implementation of the conceptual remedial plan are presented below.

- The free product layer is characterized as a D001 ignitable hazardous waste only. This removed the F003 and F005 listings previously placed on the waste stream.
- The soils in and around former Building 14 are not considered a "U" listed waste due to the presence of bis (2-ethylhexyl) phthalate (DEHP).
- RMT obtained approval to delineate an exclusion zone containing and surrounding a "wet-excavation" area to expose and reduce the residual- and free-product source area. This will enable RMT to remove immiscible product from the water in the excavation using means such as, but not limited to skimmer pumps and absorbent pads. Soil management, such as, but not limited to screening, dewatering, separation of immiscible fluids, or adding absorbent, stabilization, or solidification material to draw off any remaining free liquids will be performed in this area. There are no Resource Conservation and Recovery Act (RCRA) permitting requirements or NJDEP petition equivalency requirement for such

in-excavation activities because the point of generation for any waste (free product, contaminated soil, absorbent pads, etc.) begins after this material is removed from the excavation area and loaded into containers. Waste characterization and waste management procedures, including potential Land Disposal Restriction (LDR) requirements (if applicable), would apply only after the material has been removed from the excavation. Media impacted with the free product will be disposed of based on its hazardous characteristics only.

- As the free product carries the D001 waste code, and soils excavated from the free product zone could be managed within the "wet-excavation" area prior to characterization for off-site disposal to eliminate the characteristic of ignitability, LEC could dispose of the free product zone soils off-site as a non-hazardous industrial waste.

Prior to issuing a response to the NJDEP comment letter dated July 26, 2002, RMT, on behalf of LEC, arranged for a meeting with the NJDEP and USEPA project teams to discuss the conceptual remediation plan, waste related approvals, and the next steps toward site closure. Approval of the overall approach was reached, and the various issues and questions outlined in the July 26, 2002 letter were resolved. A formal response to agency comments and a summary of the issues discussed and agreements made at the September meeting are outlined in the RMT letter dated October 22, 2002. Conditional regulatory approval of the October 22, 2002 response to the comment letter was provided in the NJDEP letter dated January 22, 2003. This letter outlined the following main issues:

- Formal preparation and submittal of the Lead Soil FFS by February 28, 2003.
- Reevaluation of the risks (human health and ecological) associated with the 600 mg/kg remediation goal for lead-impacted soils, given the potential change in end use from an industrial/commercial use to a mixed municipal/park setting. [NOTE: The risk evaluation associated with new end use is presented in Section 4].

Section 3
Changes to ROD-Approved Approach

3.1 Regulatory Approval of Combined Lead-Impacted Soil and Free-Product Remedial Approach

As outlined in Section 2, the investigations conducted within the 4th quarter of 2001 revealed critical information regarding unknown site conditions and subsequently enabled LEC to reevaluate the overall viability of the ROD-approved alternative for lead-impacted soils (Alternative 1 – Excavation and off-site disposal). In addition, regulatory approval of the combined concept remedial plan for lead soils and free product, and approval of critical waste management issues associated with both waste streams (free product and free-product impacted soils) will enable LEC to more effectively implement this fast-track robust approach. It is these site conditions and associated regulatory approvals that frame the justification behind the preparation of this FFS, and subsequently the alternate to the existing remedial option for lead-impacted soils (Alternative 2 – Excavation and beneficial on-site reuse as subgrade fill material).

3.2 Significant New Information Affecting the Remedial Approach

Since November 2001, a significant amount of new information has been obtained that has an impact on the ROD-approved remedial approach for the LEC site. Much of this information forms the main driver for the consideration of an alternate remedial option for lead soils and is presented below.

3.2.1 Lead-Impacted Soil Volume

The primary reason regarding the consideration of a remedial alternate to soils containing lead concentrations greater that 600 mg/kg is the volumetric differential between what actually exists on-site versus what was delineated during the RIs conducted in the early 1990s. The November 2001 investigation indicated there is approximately 7,700 cy of material (soils intermixed with debris, fill and aggregate material) on-site exhibiting concentrations of lead in excess of the 600-mg/kg ROD clean-up criteria. This FFS refers to a total volume estimate of 10,190 cy, which includes surficial soils down-slope from the Building 14 area that may or may not be impacted. This represents a significant increase in the Hot Spot B and C combined volumetric estimate of 97 cy established during the RI and utilized during the FS process and ROD alternative selection.

3.2.2 Lead Leachability and Groundwater Impact

As outlined in the *Nature and Extent of Lead in Soils and Groundwater - Volumes I & II* (RMT, March 2002), the lead component in site soils exhibiting the highest lead-soil concentrations was not found to leach during SPLP analysis. In addition, concentrations (total and dissolved phase) of lead in groundwater are below groundwater quality criteria outlined in the ROD.

3.2.3 Local Interest and Investment

The Borough of Wharton has expressed an interest in developing the LEC site after completion of the conceptual remediation as a new municipal complex. The eastern side of the site [east of the rails to trails area] is proposed for conversion to a park like setting, and the western side of the site would house the new town hall and other ancillary services and buildings vital to support local government. This combined remedial approach (to include beneficial reuse of lead-impacted soils) would enable LEC to perform the majority of intrusive remedial operations in an expedited fashion prior to property deed transfer to the Borough. Once the Borough develops the municipal complex, on-site environmental activities should be limited to monitoring only. This would meet the remedial schedule of LEC, NJDEP and USEPA while also expediting the ability of the Borough to meet the development schedule of its local government's complex. LEC is currently working with the Borough to explore remedial and developmental synergies so both parties attain their objectives.

Section 4
Detailed Description of Remedial Action

4.1 Combined Lead-Impacted Soil and Free-Product Remedial Actions

4.1.1 ROD Revision to Lead-Impacted Soil Remediation Approach

As noted earlier, the NJDEP and USEPA requirement to perform this FFS arose as a result of findings from post-ROD site investigations that found soils with elevated lead contamination to occur at volumes much greater than had been anticipated at the time of the ROD. Estimates provided in the *Nature and Extent of Lead in Soils and Groundwater – Volumes I & II* (RMT, March 2002) showed that approximately 7,700 cy of soils in the vicinity of former Building 14 exceed industrial cleanup criterion of 600 mg/kg as specified in the ROD. LEC believes that off-site disposal (as called for by the ROD) for the current estimated volume of lead-impacted soils does not have a justifiable cost to risk-benefit ratio.

4.1.2 Modification to Free-Product Removal Approach

Contributing to the issue of lead-impacted soil remediation is the need to address free-product impacted soils at the site. LEC determined from additional field investigations in 2001 (*Findings and Recommendations Regarding a Conceptual Free-Product Remediation Strategy*) that the presence of free-product in the soil was coincidental to Building 14, as was the lead-impacted soil. As the ROD has called for reduction of the free-product source, and efforts to date have been of limited effect, LEC has presented and received general approval on a conceptual free-product remedial strategy. This strategy involves excavation and off-site disposal of free-product impacted soils. Inasmuch as a large fraction of the lead-impacted soils overlie the zone of the free-product impacted soils, those lead-impacted soils will have to be excavated first to affect the free-product remediation strategy. In other words, the removal of the free-product source cannot be addressed without first excavating the majority of the lead-impacted soils.

4.1.3 Need for Focused Feasibility Study Limited to Lead Remediation

It should be noted that the proposed approach to free-product reduction does not require evaluation through a formal Feasibility Study (FS). While the efforts planned to remediate free-product impacted soil are affected by the presence of the lead-impacted soil, the presence of the free-product zone is not a factor in evaluating the existing and proposed remediation of alternatives for lead-impacted soil. Therefore, the tasks and technologies directly involved to remediate the free-product impacted soil are not included within the evaluation of alternatives in this FFS.

4.1.4 Focus of the FFS

The final disposition of the lead-impacted soils overlying the product-impacted soils is the primary "focus" of this FFS. LEC had determined earlier (*L. E. Carpenter & Company, Final Feasibility Study Report*, prepared by Weston, 1993) that human health and environmental risks from lead-impacted soils to off-site receptors was low, such that on-site reuse of those soils presented a viable alternative to off-site disposal. As on-site reuse of lead-impacted soils was compatible with and beneficial to the free-product remediation strategy, LEC proposed the merger of that alternative as part of the overall strategy for remediating the free-product source. As noted earlier, reuse of the lead-impacted soils constitutes a significant deviation from the ROD selected alternative of off-site disposal. This FFS provides an evaluation of the elements, risks, costs and comparisons between the two alternatives, which are addressed herein as:

- **Alternative 1** – Off-Site Disposal of Lead-Impacted Soils
- **Alternative 2** – On-Site Beneficial Reuse of Lead-Impacted Soils

Additionally, LEC is opting for an end-use plan that involves development of the remediated site as a municipal recreation area rather than for industrial reuse. Figure 4 shows a conceptual end-use plan that has been presented to the Borough of Wharton for consideration. This plan should be considered for illustration purposes only, as it is dependent on remedial alternative selected and actual land configuration after excavation and backfill.

This FFS therefore addresses the necessary reevaluation of human health and environmental risks presented under this revised end-use scenario. **LEC has opted to use the USEPA residential remedial action goal of 400 mg/kg of lead in soils rather than the previous ROD goal of 600 mg/kg as the criterion for protection of human health.**

4.2 Overall Remedial Action Objectives

While evaluation of Lead Remediation Alternatives 1 and 2 must be evaluated by means of a lead-specific FFS, it is important to put the goals of the lead remediation in terms of the site remediation as a whole. The overall remedial action objectives for the proposed combined action to address free-product and lead contamination in the vicinity of former Building 14 are:

- Elimination of on-site and off-site human health and environment risks presented by residual lead-impacted soils or reduction to risk levels acceptable to NJDEP, USEPA and the local community, and
- Removal of a sufficient amount of the free-product source to meet the ROD requirements, and to allow for effective natural attenuation of organic contaminants potentially impacting off-site groundwater, surface water and sediments.

4.3 Structure of the Lead Remediation FFS

Inasmuch as this is a "focused" FS, screening of technologies and assemblage of a suite of potential alternatives that are normally carried out as part of a full-scale FS have been eliminated. A detailed description of the overall remediation strategy at LEC is presented in the subsections below to put the consideration of Alternatives 1 and 2 into perspective. Those process options that are common to the two alternatives are first outlined. Then, those elements of the site remediation strategy that are dependent on the final disposition of the lead-impacted soils are identified and a detailed description of the two alternatives is presented. Section 5 of this FFS then presents a detailed analysis of the Alternatives 1 and 2 and Section 6 compares Alternatives 1 and 2.

4.4 Tasks Common to Both Lead Remediation Alternatives

The combined remediation strategy, regardless of the final disposition of lead-impacted soils, involves numerous tasks. These tasks have been grouped below in the general order of proposed accomplishment.

4.4.1 On-going Groundwater Monitoring

Perform Well Abandonment – Approximately 28 existing monitoring and free product recovery wells within the area to be remediated must be abandoned in accordance with NJDEP requirements. Wells minimally affected by site grading and excavation may be retained for future use.

Perform Well Replacement – Approximately ten monitoring wells to be removed will be replaced in accordance with the approval of plans for long-term monitoring of proposed natural attenuation to be instituted after removal of the free-product source.

4.4.2 Site Control Measures

Institute Traffic Controls – Excavation, transport and stockpiling of soils along with other remedial tasks will require temporary closure of the rails-to-trails pathway as well as provisions for entrance and exit controls onto public thoroughfares.

Establish and Maintain Site Security – While the site is fenced with a locked gate, an initial task will be to repair any breaches in the fencing and to establish other security measures in the remediation area, as well as equipment staging and soil stockpile areas not contiguous to the remediation area.

Institute Soil Erosion and Sedimentation Control (SESC) Measures – Prior to initiation of site work an SESC Plan will be prepared. The plan will address erosion and sedimentation control issues anticipated during construction. These controls will include stabilization and protection of soils along the Rockaway River and any adjoining wetland habits. In addition controls will be established to prohibit excess sediment migration from soil stockpile areas.

Institute Flood Control Measures – Coupled with SESC measures, flood control measures may need to be instituted to maintain the integrity of the excavation and prevent any flooding that might transport contaminants off site during remedial efforts. In addition, the final design for the end-use plan will address requirements for compliance with floodway and flood plain ordinances. The delineation of the 100-year flood plain, the floodway and the New Jersey Flood Hazard Zone are shown on Figure 5.

Wetland Mitigation Measures – Excavation of lead impacted soils exhibiting concentrations in excess of 400 ppm within a wetland area is not anticipated. Wetland areas are depicted on Figure 5. However, implementation of the remedial approach as a whole (*i.e.*, excavation of free product soils) may require excavation within a designated wetland area. If applicable, restoration of associated wetlands will be performed in accordance with the Wetland Mitigation rules outlined in N.J.A.C. 7-7A-15. A Wetland Mitigation Plan will be prepared and included as part of the Remedial Action Plan (RAP) scheduled for completion and regulatory review prior to the initiation site remedial activities.

Establish Institutional Controls – As the end-use plan calls for municipal use of this property, institutional controls consisting of deed restrictions and due care plans will be required.

4.4.3 Removal, Stockpiling and Disposal

This section summarizes the various materials anticipated for removal and management during the conceptual remedial approach. These materials are presented in Table 8 of the *Findings and Recommendations Regarding a Conceptual Free-Product Remediation Strategy* report (RMT 2002) and are also presented as Table 1 in this report. The extent of lead impacted soils exhibiting concentrations greater than 400 mg/kg is presented in Figure 6, and the remaining areas proposed for excavation as part of the conceptual remedial approach (both lead, process waste, and free product impacted soils) is presented in Figure 7.

Demolish and Remove Existing Structures – The existing sampling shed and other remaining structures within the area to be remediated will be demolished and the materials removed to an approved off-site landfill for disposal.

Excavate and Stockpile Category A Soils around Former Building 14 – The report *Nature and Extent of Lead in Soils and Groundwater* prepared by RMT in March 2002 identified the general footprint of lead-impacted soils and soil hotspots on site. Figure 6 presents the areal limits of these soils having concentrations greater than the 400 mg/kg criterion based on data gathered during the November 2001 lead investigation. The proposed remedial excavation plan (see Figure 7) encompasses an area greater than this foot print to assure that all impacted soils are removed. The general area around former Building 14 (Area A-1) to be initially excavated is estimated to contain approximately 7,388 cy of lead-impacted soil. These soils consist of the Category Area A Soils (Table 1), identified and discussed in the *Findings and Recommendations Regarding a Conceptual Free-Product Remediation Strategy* report (RMT 2002). These soils will be excavated to an elevation of approximately 630 feet above mean sea level (MSL). These soils will be stockpiled for potential reuse or off-site disposal.

Excavate and Segregate Category B Soils – The March 2002 lead investigation report identified an area immediately east of the former Building 14 that contained process wastes with high concentrations of lead. It is planned that this area, designated as Area B-1 on Figure 7, will be excavated to an average elevation of approximately 624 feet MSL to remove these impacted soils. The excavation will involve approximately 1,556 cy of soil. As the process-waste contaminated soils (Category B Soils) are visibly identifiable in the subsurface, they will be segregated from the surrounding soils and transported to an approved off-site disposal facility as a hazardous waste. The soils from which the Category B soils are segregated will be treated as Category A soils and will be stockpiled for potential reuse as backfill. For estimating purposes it has been assumed that up to one half of the soils excavated from Area B -1 (approximately 778 cy) will be classified as hazardous and removed from the site for disposal. A photograph of the process waste anticipated for removal and off-site disposal from Area B is presented in Appendix A.

A small isolated area of Category B soils was identified on the southwest portion of the remediation area and is designated as Area B-2. Soils in area B-2 appear to be associated with process wastes and can be easily segregated by visual identification. Identifiable process waste impacted soils from this area of the southern perimeter will be combined with those from B-1 and shipped off-site for disposal.

Excavate and Stockpile Category C Soils at Building 14 – From the detailed lead investigations conducted in the vicinity of former Building 14, it is estimated that soils below the elevation of 630 feet MSL in the vicinity of the building should have lead concentrations below the 400 mg/kg criterion. Free-product investigations indicate that the free-product zone should be encountered at a depth below elevation of 628 feet MSL. Approximately 1,878 cy of soils below elevation 630 feet MSL that overlie the proposed zone of free-product impacted soils (Area C-1 soils) will be excavated and stockpiled as "clean" soil for reuse as backfill. Prior to placement as backfill, soil samples from the stockpiles of this material will be analyzed to confirm that lead levels are below the 400 mg/kg criterion.

Excavate and Stockpile Category C Soils East of Building 14 – Approximately 1,500 cy of surface soils east of Building 14 that overlie the free-product zone (Area C-2) will be excavated and stockpiled for reuse as backfill. Soils within the former disposal area that are suspected of being lead-impacted (Area A-3 on Figure 7) will be segregated into separate stockpiles. Confirmatory soil samples will be obtained from stockpiles of soils excavated from Area C-2 to determine that the lead levels are below the 400 mg/kg criterion.

Excavate, Screen and Remove Free-product Impacted Category D Soils – Under this process option approximately 10,133 cy soils beneath an elevation of 628 feet MSL that are contaminated with free-product will be excavated in the wet and screened to separate the particle size fraction < 2.5 inches in diameter. That fine soil fraction (estimated at 4,953 cy), along with any free-product generated, will be disposed of off-site at an approved facility.

Clear and Grub South Perimeter Area – Area A-2 adjacent to the Rockaway River will be cleared and grubbed of excess vegetation in preparation for soil removal and grading, and eventual restoration.

Excavate Perimeter Area Adjacent to Rockaway River (Area A-2) Soils – Isolated hot spots of lead impacted soils have been identified along the southern perimeter of the site in Area A-2. These hot spots include Area B-2 and Area A-1 soils and appear to be in the form of fill placed on top of lowland or embankment soils adjacent to the Rockaway River. The final grading plan for Area A-2 is intended as preparation for a park-like recreational setting. To accomplish this grading plan all potentially lead-impacted embankment fill will be removed from that area. The majority of those soils are anticipated to be <400 mg/kg lead. Initially the areas of known hotspots will be excavated and the soils stockpiled separately from the remaining A-2 soils.

Area A-2 will then be excavated to six inches below planned final grade with the soils being stockpiled and tested for lead content and potential beneficial reuse as backfill and/or cover material. This action is anticipated to result in excavation of approximately 2,024 cy of soils that are predominantly below the 400 mg/kg lead criterion.

Confirmatory Sampling – Confirmatory soil samples of soils not excavated from Area A-2 will be analyzed to be sure remedial action goals for lead have been achieved throughout that area, prior to restoration.

Perimeter Area Restoration – Upon confirmation of clean-soil conditions in Area A-2, the south perimeter area will be restored with topsoil and vegetation, and erosion controls will be installed, as necessary.

4.5 Alternative-Dependent Process Options

Final end-use and grading plans are dependent on whether Alternative 1 or 2 for lead-impacted soils is used. Figures 8 and 9 present estimated final grades for each of those scenarios. As Alternative 1 involves off-site disposal of a large volume of soil, an area of low lying topography would result from use of that alternative. Process options specific to each Lead Remediation Alternative are:

4.5.1 Alternative 1 – Off-Site Disposal of Lead-Impacted Soils

Under this alternative all soils would be excavated that have lead concentrations over the 400 mg/kg criterion. These soils would be disposed of at an off-site facility. Process options specific to this alternative would include:

Off-Site Trucking and Disposal of Lead-Impacted Soils – An estimated 10,190 cy of lead-impacted soils, debris and aggregate materials would be transported and disposed of at an approved off-site facility.

Confirmatory Soil Sampling of Area A-1 Soils – In addition to confirmatory sampling noted for area A-2 above, the portions of Area A-1 soil excavation not overlying the free-product excavation will be sampled to confirm that all soils over the 400 mg/kg lead criterion have been removed.

Backfilling of Primary Excavation With Clean Soils – Clean Stockpiled Soils will be used to partially backfill those areas where free-product impacted soils have been removed for off-site disposal.

Final Grading and Restoration – The site would be graded to the approximate grade as shown on Figure 8 and then top soiled, seeded and mulched. Depending on final end-use plans additional fill may need to be imported to raise the final grade.

4.5.2 Alternative 2 – On-Site Beneficial Reuse of Lead-Impacted Soil

Under this alternative all lead-impacted soils (with the exception of those found in relation to Category B process wastes) would be stockpiled for reuse as backfill. The estimated 10,190 cy of lead-impacted soils, debris and aggregate materials proposed for offsite disposal under Alternate 1, will be stockpiled for eventual reuse as subgrade fill material under this alternative. As described below, this material would be utilized as fill material above the elevation of the high water table (629 feet MSL). Additional process options specific to this alternative include:

Backfilling of Primary Excavation With Clean Soils – Clean Stockpiled Soils (overburden soils with <400 mg/kg lead) will be used to partially backfill those areas where free-product impacted soils have been removed for off-site disposal.

Placement of Imported Clean Backfill – To separate placement of lead-impacted soils above the high water table will require placement of approximately 6,642 cy of clean backfill to an elevation 629 feet MSL. It is estimated that there will be insufficient clean stockpiled soils to accomplish backfilling the entire excavation. To support Alternative 2 additional clean backfill (approximately 3,264 cy) will be imported to provide that vertical separation.

Placement of Lead-Impacted Backfill – Lead-impacted backfill (stockpiled material >400 mg/kg lead) would be placed in the excavation above an elevation of 629 feet MSL within the bounds of the area shown on Figure 9. The fill would be graded to conform to a level terrace within those bounds having an elevation of approximately 634 feet MSL.

Placement of Final Cover – A protective layer of coarse granular fill material would be placed over the top of the lead-impacted soils to a final grade elevation of 636 feet MSL. This layer would (1) provide separation from site users, (2) would discourage burrowing biota, and (3) provide erosion protection. The cap would have an optional cover of topsoil or pavement (*i.e.*, asphalt, tennis court, basketball court, hockey rink) dependent on the final end-use plan. Completion of the surface (~ 1.5 acres) has not been included in the cost estimates for this Alternative.

Placement of Permanent Erosion Controls – The surface of the lead-impacted soil terrace would be armored with erosion controls to prevent any scouring should flooding above elevation of 630 feet MSL occur.

4.6 Applicable or Relevant and Appropriate Requirements (ARARs)

In 1980 Congress passed a law called the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly referred to as Superfund. The law authorizes the Federal government to respond directly to releases, or threatened releases of hazardous substances that may endanger public health, welfare or the environment. In 1986, CERCLA was updated and improved under the Superfund Amendment and Reauthorization Act (SARA).

CERCLA Section 121 (d)(2)(A) requires that remedial actions meet any federal standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate. CERCLA Section 121 (d)(2)(A)(ii) requires state ARARs to be met if they are more stringent than federal requirements. In addition, the National Contingency Plan (NCP), published in 40 Code of Federal Regulations (CFR) Part 300, requires that local ordinances, unpromulgated criteria, advisories, or guidance that do not meet the definition of ARARs but that may assist in the development of remedial objectives be listed as "to be considered" (TBC). ARARs are identified on a site-by-site basis for all on-site response actions where CERCLA authority is the basis for cleanup.

4.6.1 Categories of ARARs

ARARs consist of two sets of requirements, those that are applicable and those that are relevant and appropriate.

Applicable requirements – are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal, state, or local law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site.

Relevant and appropriate requirements – are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal, state, or local law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site, address problems or situations sufficiently similar to those encountered at a CERCLA site. For these requirements to apply to CERCLA site cleanups, they have to be considered both relevant and appropriate.

ARARs may be divided into the following categories:

- **Chemical specific requirements** – which define acceptable exposure concentrations or water quality standards (*i.e.*, Lead cleanup criteria for soils of 600 mg/kg and 400 mg/kg under industrial and residential end-use scenarios, respectively)
- **Location-specific requirements** – which may restrict remediation activities at sensitive or hazard-prone locations (*i.e.*, wildlife habitat, wetlands and flood plains).
- **Action-specific requirements** – which may control activities and/or technology (*i.e.*, well abandonment procedures).

ARARs and TBCs identified in for this FFS are outlined in Table 2, are discussed in general terms below, and are discussed within the analysis for each Alternative in Section 5.

4.6.2 Chemical-Specific Requirements

"Chemical-specific requirements set health standards or risk-based concentration limits or discharge limitations in various environmental media for specific hazardous substances, pollutants, or contaminants. These requirements generally set protective cleanup levels for chemicals of concern in the designated media or indicate a safe level of discharge that may be incorporated in a remedial activity." (WESTON, 1993 Final Feasibility Study Report).

Lead was identified as the target contaminant of concern for this FFS as it is the only contaminant for which a ROD change is required. Lead requirements are presented in Table 2, and are included in this FFS as each requirement sets a specific contaminant concentration deemed applicable to various environmental media. These chemical requirements are considered applicable to either lead soil remedial alternative (1 or 2) as both have the potential to impact groundwater, surface water, sediments, and soils. In addition, these criteria are also considered applicable to the creation of sediment and erosion controls proposed for institution at the implementation of construction activities. Groundwater, surface water, and site soils will be monitored for compliance with these lead specific ARARs throughout implementation of the proposed remedial action, during post remedial confirmation monitoring, and during the evaluation of post remedial compliance via monitored natural attenuation (MNA).

Groundwater within the vicinity of the site is considered a potential source of drinking water and is located within the boundaries of Class IIA groundwater. As specified under N.J.A.C. 7:9-6 Appendix Table 1, New Jersey (NJ) has adopted a total lead concentration in Class IIA groundwater of 5 µg/L. In addition NJ has also adopted a surface water quality criteria for lead of 5 µg/L [total recoverable]. This represents the noncarcinogenic effect-based human health criteria as a 30-day average with no frequency of exceedence at or above the design flows specified in section N.J.A.C. 7:9B-1.5(c) 2. This criteria is considered applicable to the surface water quality requirements of the Rockaway River.

Lead cleanup criteria applicable for soils at the LEC site are provided in the Cleanup Standards for Contaminated Sites, N.J.A.C. 7:26D (Last Revision 5/12/99). The soil specific cleanup criteria for lead as outlined in the 1994 ROD is a risk base concentration of 600 mg/kg based on an industrial/commercial exposure scenario. This criteria is health based using an incidental ingestion exposure pathway and is subject to change based on site specific factors (*e.g.*, aquifer classification, soil type, natural background, environmental impacts, etc.). As the potential end use scenario may change to a municipal/park setting, this criteria is considered relevant and appropriate. As outlined in Section 4.4.1, LEC considers the 400 mg/kg Residential Direct Contact Soil Cleanup Criteria (RDCSCC) specified in N.J.A.C. 7:26D as applicable given the potential change in end use exposure. This criterion is based on the USEPA Integrated Exposure Uptake Biokinetic (IEUBK) model utilizing the default parameters. The concentration is considered to protect 95% of target population (children) at a blood lead level of 10 micrograms of lead per deciliter (µg/dL).

There is a potential for construction workers to get be to fugitive lead dust via inhalation and/or ingestion of particulate matter generated during proposed grading, clearing, and excavation activities within lead impacted areas. The 8-hour time weighted average of 50 micro grams per cubic meter (µg/m3) is considered applicable to construction worker and ambient air monitoring protocols.

4.6.3 Action-Specific Requirements

As previously mentioned, action-specific requirements are those requirements that may be considered applicable or relevant and appropriate based on the need to perform specific site activities required to implement a specific remedial action. Action specific ARARs are activity or technology based. Action-specific ARARs and TBCs associated with this FFS are outlined in Table 2. Action specific ARARs defined within the text below are outlined as LEC will be performing site actions such as excavation, stockpiling, waste hauling, and backfilling operations proposed in the conceptual remedial approach.

The Resource Conservation and Recovery Act (RCRA) regulates various waste management activities in order to promote resource protection and protect human health and the environment. Applicable RCRA requirements cited in 40 CFR § 260, 261, 263, and 268 and the NJ implemented RCRA program enforced through New Jersey Administrative Code (N.J.A.C.) 7:26G are considered applicable to the actions proposed within this FFS as there is a potential to encounter either listed and/or characteristic hazardous wastes (*i.e.*, process waste as shown in Appendix A and free phase product) during site excavation activities. Prior to landfilling, treatment of contaminated solid media must ensure that the levels of contaminants are in compliance with RCRA land disposal requirements outlined in 40 CFR § 268.

Site remedial activities (*i.e.*, investigation and cleanup) in New Jersey are evaluated against the minimum technical requirements outlined in the "Technical Requirements for Site Remediation" (N.J.A.C. 7:26E) ("the Tech Rule") and are considered applicable to CERCLA sites. These rules define the requirements to investigation, remediate, report, and certify remedial projects in New Jersey. Additional guidance documents regarding site cleanups in New Jersey such as "Guidance Document for the Remediation of Contaminated Soils" (January 1998), which provide guidance regarding soils excavation and reuse, are to be considered during this evaluation.

N.J.A.C. 7:9D constitutes the rules governing the requirements and standards for the permitting, construction and decommissioning of wells, the standards and requirements for the licensing of all well drillers of the proper class and pump installers in accordance with N.J.S.A. 58:4A-4.1 et seq., and the activities, duties, procedures and practices of the State Well Drillers and Pump Installers Examining and Advisory Board. This code is considered applicable because during excavation activities numerous existing monitoring wells and wells points will require abandonment prior to implementation of the chosen remedial alternative. In addition, new wells will require installation to continue with site monitoring activities. Abandonment and installation of monitoring wells will be performed in accordance with the requirements outlined in N.J.A.C. 7:9D.

Activities associated with on site health and safety and environmental management of constructions activities will be performed in accordance with the requirements outlined in 29 CFR 1910 and 1926. These standards govern the occupational safety and health issues associated with this project such as, hazardous material operations, occupational noise, personal protective equipment (PPE), hazard communication, and transportation of hazardous materials.

Various environmental monitoring and control requirements associated with excavation and general disturbance of large land surface areas will be evaluated. Soil and sediment control measures and other applicable best management practices (BMPs) associated with disturbed areas and stockpiled materials need to be considered. Soil and sediment erosion control measures will be outlined in a Storm Water Management Plan (SWMP). In addition, the Phase II Final Rule, published in the Federal Register on December 8, 1999 (64 FR 68722), requires National Pollutant Discharge Elimination System (NPDES) permit coverage for storm water discharges from construction activity disturbing between 1 and 5 acres of land (*i.e.*, small construction activities). In accordance with the Phase II rules, LEC would submit a storm water discharge Notice of Intent (NOI) and an SWMP with BMPs to the NJ NPDES permitting authorities to request approval to allow controlled discharge of site runoff during construction activities. The SWMP with associated BMPs would also be submitted to Morris County Soil Conservation District for review and approval. In addition, LEC would file the appropriate Notice of Termination (NOT) once the site had been stabilized (Ref 40 CFR 122, 123, & 124 and N.J.A.C. 7:8).

Both State and local ordinance regarding noise are considered relevant and appropriate for construction. As such LEC will ensure compliance with noise regulation (N.J.A.C. 7:29) and local ordinance (Borough of Wharton). Within the noise regulations, there are established sound level standards of 50 decibels during nighttime (10:00 p.m. to 7:00 a.m.) and 65 decibels during daytime. In addition, the use of aboveground storage tanks (ASTs) to contain liquid waste (*i.e.*, free product and limited volumes of contaminated ground) may be required throughout construction. Subsequently, the prevention and control of discharges through the use of secondary containment measures, in accordance with N.J.A.C. 7:1E-2 will be performed.

4.6.4 Location-Specific Requirements

Location-specific ARARs restrict action or contaminant concentrations in certain environmentally sensitive areas such as floodplains and wetlands, and locations where threatened and endangered species and historically significant cultural resources exist. The issues discusses below are considered applicable relevant and appropriate to the proposed remediation.

Executive Order 11988 entitled "Floodplain Management" dated May 24, 1977 states that action must be taken to avoid adverse effects, minimize potential harm, and restore the site to its natural state when operating in normal floodplain or lowlands near surface water bodies. New Jersey has adopted rules governing the enforcement of the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq.). These Flood Hazard Control Rules [N.J.A.C. 7:13] regulate development within the floodplain, flood fringe, and flood way to "...minimize the potential of on and off site damage to public or private property caused by development which, at times of flood, subject structures to flooding and increase flood heights and/or velocities both upstream and downstream. These rules are also intended to safeguard the public from the dangers and damages caused by materials being swept onto nearby or downstream lands, to protect and enhance the public's health and welfare by minimizing the degradation of water quality from point and non point pollution sources and to protect wildlife and fisheries by preserving and enhancing water quality and the environment associated with the flood plain and the watercourses that create them."(N.J.A.C. 7:13-1.1).

These rules also require that all projects involving permanent excavation within the flood plain shall not have cut faces at slopes steeper than a ratio of two horizontal to one vertical (N.J.A.C. 7:13-2.6) and require an SWMP be submitted to the Department (N.J.A.C. 7:13-2.8) clearly outlining applicable sediment and erosion controls and other best management practices. Soil erosion and sediment controls rules as outlined in N.J.A.C. 7:13-3.3 describe the measures to control and minimize disturbance of any surface area during construction. The latest revised version of the "Standards for Soil Erosion and Sediment Control in New Jersey" promulgated by the New Jersey State Soil Conservation Committee pursuant to the Soil Erosion and Sediment Control Act of 1975 as amended, N.J.S.A. 4:24-42 et seq. and N.J.A.C. 2:90 will to be considered during the evaluation of these controls.

New Jersey has also adopted rules governing the implementation of the Freshwater Wetlands Protection Act, N.J.S.A. 13:9B-1 et seq., and the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq. These Freshwater Wetlands Protection Act Rules (N.J.A.C. 7:7A) regulate activities such as the removal, excavation, and disturbance or dredging of soil, sand, gravel, or aggregate material of any kind within a freshwater wetland. These activities are subject to NJDEP and U.S. Army Corps of Engineers (USACOE) review and permitting prior to initiation. In addition, mitigation measures in accordance with N.J.A.C 7:7A-15 shall be required as a permit condition in order to compensate for any loss or disturbance of freshwater wetlands if applicable.

The National Historic Preservation Act of 1966 (16 U.S.C. 470) & the New Jersey Register of Historic Places Act of 1970 (N.J.S.A. 13:1B-15.128 *et seq.*) outlines the federal and NJ requirements and rules concerning the preservation of the States historic, architectural, archaeological, engineering, and cultural heritage. These rules require that action be taken to preserve historic places. The Stage 1A Cultural Resource Survey presented as Appendix B in the report entitled *Final Supplemental Remedial Investigation Addendum for L.E. Carpenter and Company* (Roy F. Weston, September 1992) stated that the LEC site "...possesses moderate potential for prehistoric archeological resources" and recommended "...that ground-disturbing activities on the LEC property which will affect soils below a depth of two (2) feet in the portion of the site northwest of the railroad right-of-way and below five (5) feet in the portion of the site southeast of the railroad right-of-way be preceded by a Stage 1B archaeological survey. Evaluation of a stage 1B cultural resource survey will be performed as part of the final RAP. In addition, this survey indicated that the 1889 Ross and Baker Silk Mill located adjacent to the Washington Forge Pond had "...considerable potential to constitute a significant historical archaeological resource."

N.J.A.C 7:13-3.9 sets forth standards by which the NJDEP shall issue a permit for an activity regulated within a environmentally sensitive area only if the activity will not adversely affect populations of species of threatened or endangered plants or animals documented in the areas. A survey for threatened and endangered species may be required if a proposed project will disturb an area documented to contain a threatened and endangered species, or nearby areas in which the habitat that can support these species is present. Information pertaining to threatened and endangered species occurrences on or near a project site may be obtained by contacting the Natural Heritage Program, in Trenton New Jersey.

4.7 Human Health Assessment

4.7.1 Objectives

RMT received a correspondence on January 22, 2003, from NJDEP, which transmitted technical review comments on the content of the FFS for LEC. NJDEP are concerned with the potential risk associated with the proposed change of the future use of the property from long term industrial/commercial to that of mixed municipal/recreational use. Specifically, NJDEP are concerned that the lead remediation goal of 600 mg/kg for soil proposed for the LEC facility under the commercial/industrial exposure scenario would not be protective of children via direct contact under a part recreational exposure scenario. NJDEP requested that an evaluation be conducted to assess the potential risks to children associated with the soil remediation goal for lead proposed for the LEC facility. To conduct this evaluation RMT used the following guidance documents:

- USEPA. *Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities*. August 1994. EPA/540/F-94/043.
- USEPA. *The IEUBK Model, Lead Workgroups, Superfund.* www.epa.gov/superfund/programs/lead/ieubk.htm.

4.7.2 Lead Remediation Goal

A remediation goal of 400 mg/kg lead is proposed for exposed soils at the LEC facility. This lead remediation goal is considered protective for direct contact of children with soils under a residential exposure scenario (NJDEP, January 1998). The lead remediation goal of 400 mg/kg cited in *Guidance Document for the Remediation of Contaminated Soils* (NJDEP, January 1998) was derived using the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK) (USEPA, 1994).

The IEUBK model is designed to predict the probable blood lead concentrations for children between 6 months and 7 years of age who have been exposed to lead in air, water, soil, dust, and the diet (USEPA, 2003). The objective of the IEUBK, in terms of a soil remediation goal, is to derive a soil lead concentration upon which exposure by a child will not result in a blood lead concentration greater than 10 µg-lead/dL blood. It is this blood lead concentration (10 µg-lead/dL) in children that the USEPA considers a point of departure for the consideration of the potential unacceptable adverse effects in children.

Pertinent assumptions of the IEUBK include, but are not limited to:

- Probable blood lead concentration of the child is based on a residential exposure scenario.
- The exposure of the child to lead is continuous between the ages of 6 months and 7 years.
- Sources of lead include all environmental media and some food sources.

The complete exposure pathways for the child incorporated into the IEUBK include:

- Exposure to lead contained in indoor and outdoor air.

- Exposure to lead in the diet from the consumption of meat, including fish, vegetables, fruits, and dairy sources.
- Exposure to lead in potable water sources.
- Exposure to lead from incidental ingestion of soil.

The proposed remediation goal for lead in soil at the LEC facility (400 mg/kg) was derived using default child exposure values for the IEUBK. This concentration (400 mg/kg) was proposed by the United States Environmental Protection Agency (USEPA) Office of Solid Waste and Emergency Response (OSWER) as the protective lead concentration for children under an unrestricted residential exposure scenario in evaluating CERCLA and RCRA sites (USEPA, 1994).

The proposed future use of the LEC property is that of a mixed municipal use. Exposures to site-related environmental media under this scenario are expected to be much less than what would be expected for a residential exposure scenario. Remediation of the LEC property to a lead standard (400 mg/kg) derived based on and considered protective of a residential exposure scenario would provide an additional level of safety and protection for any expected human receptors.

4.8 Ecological Health and the Environment

4.8.1 Original Ecological Risk Assessment

The potential impacts from historical operations conducted at the LEC facility to the site-related ecosystem were evaluated by conducting an ecological risk assessment. LEC submitted the *Rockaway River Sediment Ecological Assessment Report* (WESTON, 1992) to the NJDEP and the USEPA as part of a previous investigation. This ecological risk assessment evaluated the potential impacts to that portion of the Rockaway River abreast of the LEC facility. NJDEP agreed with the conclusion of the ecological risk assessment that historical operations associated with the facility did not pose an unacceptable risk to the environment (NJDEP, February 1993).

4.8.2 Additional Environmental Inventory

RMT performed a search for critical wildlife habitats in the vicinity of the LEC through New Jersey's Landscape Project (*NJDEP Division of Fish & Wildlife, Endangered and Nongame Species Program*). The mapping and inventory (see Appendix B) show that a portion of the Rockaway River bordering the south side of the site is a State Threatened Emergent Wetland. A small area at the north end of the drainage ditch between LEC and Air Products is noted as a State Threatened Grassland habitat. The area along the

Rockaway River beginning at the southeast corner of the site and extending downstream is delineated as State Threatened Wetland Forests, Emergent Wetlands, Forest, and Grassland habitats. WESTON had indicated that the area along the drainage ditch to its confluence with the Rockaway River was also a wetland environment (see Figure 5)

No endangered species were identified in the Landscape Project inventory for the area. One threatened species; the wood turtle (*Clemmys insculpta*) was identified as being associated with each of the habitats listed above. Appendix B also contains a listing of Rare Species and Natural Communities present in Morris County. RMT performed an additional environmental data search to identify potential endangered or threatened species and habitats in the vicinity of LEC.

4.8.3 Assessment of Environmental Impact

Remediation Alternatives 1 and 2 discussed in this FFS should not alter the conclusion of the *Rockaway River Sediment Ecological Assessment Report* (WESTON, 1992). Under Alternative 2, the clean soil cover proposed for those portions of the facility with lead concentrations greater than 400 mg/kg will prevent direct exposures for most, if not all, potential ecological receptors. The quality of the habitat for these portions of the facility is such that it is not expected that a significant number and variety of species will inhabit these areas. Likewise, the depth of the proposed capping system under Alternative 2 will be such that exposure to any potential burrowing species of significance is not expected.

The potential for site-related constituents to impact the surface water and sediment of the Rockaway River as a result of leaching into groundwater and subsequent migration to surface water has previously been evaluated in the *Rockaway River Sediment Ecological Assessment Report* (Weston, 1992). In addition, a synthetic precipitation leaching procedure (SPLP) performed on site-related soils demonstrated that potential impacts to groundwater were less than New Jersey groundwater quality criteria (RMT, 2002).

4.9 Cultural Resource Impacts

LEC conducted a cultural resources survey in 1992 and reported the results in the *Final Supplemental Remedial Investigation* (September, 1992). The results of that investigation indicate that the remedial efforts discussed in this FFS should not impact any local structures of historical importance. In addition the study did not identify any potential archaeological sites within the project area.

Section 5
Detailed Analysis of Alternatives

5.1 Evaluation Criteria

Each of the alternatives described in Section 4 must be evaluated against the nine criteria as defined by the NCP and USEPA Superfund guidance. The purpose of the analysis is to provide relevant information necessary to allow the selection of a preferred alternative. The nine criteria are grouped as follows:

Threshold Criteria that must be met by each alternative

1. Protection of human health and the environment
2. Compliance with ARARs

Balancing Criteria used to compare the alternatives

3. Long-term effectiveness and permanence
4. Reduction of toxicity, mobility and permanence
5. Short-term effectiveness
6. Implementability
7. Cost

Modifying criteria affecting the overall acceptance of the alternatives

8. State acceptance
9. Community acceptance

The details of this criteria are outlined below:

5.1.1 Overall Protection of Human Health and the Environment

Each alternative must be evaluated to determine whether it attains and maintains an adequate level of protection of human heath and the environment. This criterion involves assessment under other evaluation criteria including long-term effectiveness and compliance with ARARs as well as consideration for the preference for on-site remedial actions.

5.1.2 Compliance with ARARS

Each alternative must be evaluated to determine if all federal, state and local ARARS that have been identified would be met by the proposed action. Compliance with identified chemical, location and action specific ARARs are discussed under each alternative. The identified ARARs as listed in Table 2.

5.1.3 Long-Term Effectiveness and Permanence

Alternatives must be evaluated to determine the risk remaining after the proposed remedial action under that alternative has been completed. Given the nature of this action to address lead-contaminated soil, the focus is on the adequacy of the design to maintain and control lead contamination from contact with human and ecological receptors and the institutional or other controls necessary to sustain the low level of residual risk.

5.1.4 Reduction of Toxicity, Mobility and Volume

The alternatives must be evaluated to determine the level, to which each alternative reduces the mass or volume of contaminant, irreversibly reduces its mobility, or destroys its toxicity. Specific factors to be considered are amount of lead-impacted soil to be addressed and the degree to which the soils left on-site can be stabilized to minimize leaching.

5.1.5 Short-Term Effectiveness

This criterion applies to the effects on human health and the environment that may occur during implementation of the remedial action. Factors to be addressed for each alternative during construction operations include:

- Protection of the community, particularly the rails-to-trails areas, local street traffic and surrounding neighborhoods.
- Protection of remediation workers and on-site visitors
- Impacts to the Rockaway River and adjoining ecologic habitats
- Time to achieve objectives
- Air quality impacts to surrounding Borough receptors

5.1.6 Implementability

Each alternative is evaluated against the technical and administrative feasibility of implementing the remediation approach, and the availability of services and materials necessary for its completion.

5.1.7 Cost

Detailed quantity and cost analyses were performed for each alternative. These are summarized in Appendix C and in Tables 3 and 4. These costs were estimated in terms of capital costs including direct and indirect costs. Direct costs include equipment, materials, supplies, labor, transportation and disposal costs. Indirect costs include engineering fees, overhead and profit and allowance for contingencies. Costs were based on a variety of sources including vendor information, analysis of current construction indices, and commercial disposal rate. These costs are provided to an accuracy of +50 percent to -30 percent and are in year 2004 dollars.

It should be noted that Operations and Maintenance (O&M) costs have not been included in these estimates or cost comparison. For estimation and cost comparison purposes it is assumed the end-use of the site will include upkeep by the municipality. The largest O&M factor will be long-term monitoring of the site. These costs will be included as part of the overall site remedial action as covered in the ROD.

The primary cost factor relating to comparison of the alternatives is the difference between transporting materials off-site to an approved disposal facility versus backfilling of the soils and providing adequate cover materials. All other cost elements for either alternative are related to the costs of free-product removal, and those cost remain essentially the same, regardless of the disposition of the lead-impacted soils. Therefore, the cost elements directly relating to the handling and disposition of lead-impacted soils will be broken out of the overall cost estimates for discussion purpose in the following analyses.

5.1.8 State Acceptance

Each criterion must evaluate the technical and administrative concerns provided by the state of New Jersey. These are not discussed herein, but will be addressed upon receipt of comments on this FFS.

5.1.9 Community Acceptance

The community has expressed support for the proposed end-use plan of this site for municipal use. Otherwise, this criterion is not discussed within this FFS, but will be addressed upon receipt of comments.

5.2 Alternative 1 – Off-Site Disposal of Lead-Impacted Soil

Section 4 of this FFS presented detailed descriptions of each alternative to be evaluated. This alternative, as part of the overall objective of remediating the lead- and product-contaminated soil on the eastern portion of the LEC site, involves the off-site transportation and disposal of soils exceeding the clean-up criterion of 400 mg/kg lead. Specific additional process elements as outlined in Section 4.5 and to be considered include:

- Off-site trucking and disposal of lead-impacted Soils
- Confirmatory soil sampling of excavation areas
- Backfilling of primary excavation with clean soils
- Final grading and restoration

5.2.1 Overall Protection of Human Health and the Environment

Exposure Prevention – Current lead levels of surficial soils within the area of elevated lead (>400 ppm) on site range as high as 3,000 mg/kg and average 437 mg/kg. Lead concentrations in isolated hot spots within deeper soils have been detected ranging from about 6,800 mg/kg to as high as about 12%, but these levels represent process wastes that are limited in extent and will be disposed of off-site as hazardous waste (Category "B" soils; Table 1). Alternative 1 meets the remedial action objective by removing all on-site lead-impacted soils and process-related wastes to levels below the residential lead criterion of 400 mg/kg. This would permanently reduce potential exposure to humans to levels below that criterion. Because there is a slight potential that some unidentified lead hotspots may still remain after excavation, confirmatory soil sampling would be conducted to verify effective removal to levels below the 400 mg/kg criterion.

Environmental Protection – While no impact to on-site or off-site ecosystems from lead-impacted soils has been identified at LEC, this alternative would significantly reduce the potential for migration to off-site receptors or ecosystems by eliminating sources of elevated lead concentration.

This alternative is in conflict with on-site remedial approaches and would result in loss of landfill space. As lead cannot be destroyed by chemical means, the alternative would simply transfer the material geographically.

5.2.2 Compliance with ARARs

Table 2 lists ARARs pertinent to this remediation effort. While all of the ARARs listed must be considered, the following discusses those that appear most critical to the activities to take place under Alternative 1:

Chemical-Specific ARARs

The alternative will meet the chemical-specific ARAR of reducing soil levels to below the required 400 mg/kg statutory levels for residential use and 600 mg/kg for industrial use. The alternative will lower the potential of the site to exceed the NJ Groundwater Quality Criteria for Class IIA aquifers for lead of 5 µg/L.

Location-Specific ARARs

Excavation and restoration will be required in and adjacent to 100-year and New Jersey flood hazard zones and floodways. Controls will be necessary to assure that these flood hazard areas are not permanently obstructed and that the excavation and closure of the site does not exacerbate release of lead-impacted soils to the Rockaway River or adjoining wetlands. Stockpile and equipment staging areas may also be located within the 100-year flood zone.

Excavation of soils from adjoining wetland areas will be minimized. Excavation into the Rockaway River, however, is not necessary, such that provision of erosion and sedimentation controls during remediation should minimize impact to aquatic and wetland species and communities.

The remedial alternatives discussed in this FFS are not anticipated to impact any local historical sites or other cultural resources.

Action-Specific ARARs

Excavation of soils and transfer of soils may result in generation of lead-laden airborne dust. Dust control measures will be utilized as necessary to maintain compliance with emissions standards. Air monitoring will be necessary to assure compliance with ambient standards.

Stockpiling of Category A, Category B and Category C soils will require segregation to prevent contamination of specific soils with soils having a different waste classification.

Construction equipment will create noise, such that effective controls including specified working hours would be necessary.

Storm water runoff and erosion control measures will require preparation and adherence to a strict Soil Erosion and Sedimentation Control Plan to minimize excessive loss of sediment downstream and into wetlands.

5.2.3 Long-Term Effectiveness and Permanence

Residual Risks – In the sense that Alternative 1 would permanently transfer all soils exceeding the 400 mg/kg criterion from the LEC site, the long-term effectiveness of this alternative to reduce on-site human health risks would be high. No institutional controls or restrictions regarding use of the site would have to be imposed due to the presence of lead.

Environmental Effects – Resulting long-term risks to off-site receptors and ecosystems would be eliminated by this action..

Socioeconomic Issues – Removal of excessive volumes of lead-impacted soil from the site may result in an excessively low-lying area or area susceptible to flooding, unless this soil is replaced with imported clean fill. This may impact the uses and feasibility of the municipal end-use plan.

Irreversible and Irretrievable Commitment of Resources – This alternative should not result in long-term loss of impacted wetland areas on the eastern portions of the site as they lie outside the area of excavation and backfill. A minor but temporary disturbance may occur in the vicinity of the drainage ditch between LEC and Air Products. Critical adjoining habits will be protected during remediation. Off-site disposal of the soils will result in a substantial loss of landfill capacity.

5.2.4 Reduction of Toxicity, Mobility and Volume

The amount of soil exceeding the 400 mg/kg criterion on site is estimated to range from 8,000 to approximately 10,000 cy. This volume would be eliminated from the site by implementation of Alternative 1. As the material would be removed in-total, the risk of mobility would and toxicity would also be negated. It should be noted that the Category A soils to be removed and disposed off-site under this alternative do not exceed SPLP leaching test criteria, and there is no evidence that an active groundwater migration pathway is present. Surface erosion of the contaminated soils with associated sediment-borne mobility of lead, would be eliminated by this alternative.

The alternative does not meet the statutory preference for treatment.

5.2.5 Short-Term Effectiveness

Alternative 1 will require the movement of a large amount of soil, increasing the potential for inhalation of airborne dusts by site workers and the local community. Dust control measures may be required in both excavation and staging areas.

Tracking of contaminated soils between stockpiling and staging areas, as well as from trucks transporting soils off-site to a disposal facility will also require special measures to reduce the potential for public exposure.

Worker exposure will have to be addressed by utilization of appropriate personal protective gear and institution of appropriate construction worker health and safety plans.

The open excavation will present physical hazards that will require some degree of control and protection.

Temporary increased truck traffic will amount to at least 1,000 trucks entering and exiting the site over an approximately 2 month period. This will result in nuisance as well as an added traffic hazard to the immediate neighborhood.

This alternative may also temporarily disrupt wetlands and river ecosystems in close proximity to the site. Excavating equipment and trucking activities will also provide a noise nuisance to the neighborhood that will require control of working hours.

5.2.6 Implementability

Technical Feasibility – Excavation of the lead-impacted soils is technically feasible. It will be a difficult excavation because of the coarse soils, debris and boulders involved. Exposure of the large areas of excavation, particularly in close approximation to the Rockaway River will require installation of effective soil erosion and sedimentation controls to limit the risk of overland flow of contaminants to the Rockaway River and adjacent wetland areas. The low potential for a major flood event during construction should be considered. Effects of a flood would be minimized by protection of stockpiles and temporary placement of embankments adjacent to excavated areas.

Availability of Services and Materials – There appear to be no major material or supply limitations to implementation of this alternative. Trucking of this large amount of contaminated soil will require a substantial fleet of approved trucks. Temporary stockpiling of large volumes of soils and backfill material may require extension of staging areas into sections of the LEC property west of the rails-to-trails corridor. There appears to be sufficient available space within the LEC property for staging and stockpile areas.

Administrative Feasibility – Truck trafficking and staging will require temporary closure of the rails-to-trails area of the site and implementation of strict traffic control procedures for trucks and equipment entering and exciting the site. Permitting of earthwork and related activities adjacent to floodplains and wetland areas may incur some administrative delays. There are no long-term institutional controls associated with this alternative.

5.2.7 Costs

Detailed quantity estimates are presented in Appendix C, and the associated costs are summarized on Table 3.

The total costs for the combined remedial approach that is inclusive of the items listed in Section 4 for Alternative 1 are approximately $3,777,960. To simplify cost comparison purposes the costs of process elements related to excavation and off-site disposal of the lead-impacted soils have been broken out to include only those capital costs that are affected by selection of either Alternative 1 or Alternative 2. These costs include:

- Off-Site Trucking and Disposal of Lead-Impacted Soils (10,190 cy)
- Import and Place Clean Backfill (3,264 cy)
- Final Grading and Restoration (3 Acres)

Table 5 presents a summary of the costs that total $998,073 for the process elements directly related to this Alternative.

5.3 Alternative 2 – On-Site Beneficial Reuse of Lead-Impacted Soil

A detailed description of Alternative 2 is presented in Section 4. This alternative, as part of the overall objective of remediating the lead- and product-contaminated soil on the eastern portion of the LEC site, involves the excavation and on-site reuse of soils exceeding the clean-up criterion of 400 mg/kg lead. Specific additional process elements as outlined in Section 4.5 and to be considered include:

- Excavation and stockpiling of Category A soils
- Backfilling of primary excavation with clean soils
- Placement of imported clean backfill
- Placement of Category A soils as backfill
- Placement of final cover
- Placement of permanent erosion controls
- Final grading and restoration

5.3.1 Overall Protection of Human Health and the Environment

Exposure Prevention – Current lead levels in surficial soils on site range as high as 2,875 mg/kg and average 437 mg/kg. Lead concentrations in hot spots within deeper soils have been detected as high as 6,500 mg/kg. This alternative meets the remedial action objective by consolidating and isolating from potential direct human contact on-site lead-impacted soils to levels below the residential criterion 400 mg/kg. This would reduce potential exposure to humans utilizing this site as a municipal park to levels acceptable under a residential risk scenario. As there is a slight potential that some unidentified lead hotspots may still remain outside the consolidation area after excavation, confirmatory soil sampling would be conducted to verify effective removal to levels below the 4000 mg/kg criterion in these areas.

Environmental Protection – While no impact to groundwater or on-site or off-site ecosystems and receptors from lead contamination has been identified at LEC, this alternative would significantly reduce the potential for migration to off-site receptors or ecosystems by preventing transport of eroded and airborne soils off site and isolating the soils from burrowing organisms. All consolidated soils exceeding the 400 mg/kg criterion would be placed above the seasonally high water table to prevent leaching of lead.

This alternative is compatible with on-site remedial approaches and would not result in loss of landfill space.

5.3.2 Compliance with ARARs

Table 2 lists ARARs pertinent to this remediation effort. While all of the ARARs listed must be considered, the following discusses those that appear most critical to the activities to take place under Alternative 2:

Chemical-Specific ARARs

Alternative 2 will meet the chemical-specific ARAR of reducing soil levels to below the requires 400 mg/kg statutory levels for residential use and 600 mg/kg for industrial use. Risk assessment also indicates that Alternative 2 will achieve the computed fetal blood concentrations for lead. The alternative will lower the potential of the site to exceed the NJ Groundwater Quality Criteria for Class IIA aquifers for lead of 5 µg/L.

Location-Specific ARARs

Excavation and restoration will be required in and adjacent to 100-year floodplains and floodways. Controls will be necessary to assure that these flood hazard areas are not permanently obstructed and that the excavation and closure of the site does not exacerbate release of lead-impacted soils to the Rockaway River or adjoining wetlands. Stockpile and equipment staging areas may also be located within the 100-year and New Jersey flood hazard zones.

Excavation of soils from adjoining wetland areas will be minimized. Excavation into the Rockaway River, however, is not necessary, such that provision of erosion and sedimentation controls during remediation should minimize impact to aquatic and wetland species and communities.

The remedial alternatives discussed in this FFS are not anticipated to impact any local historical sites or other cultural resources (*i.e.*, 1889 Ross and Baker Silk Mill).

Action-Specific ARARs

Excavation of soils and transfer of soils may result in generation of lead-laden airborne dust. Dust control measures will be necessary to maintain compliance with emissions standards. Air monitoring will be necessary to assure compliance with ambient standards.

Stockpiling of Category A, Category B and Category C soils will require segregation to prevent contamination of specific soils with soils having a different waste classification.

Construction equipment will create noise, such that effective controls including specified working hours would be necessary.

Storm water runoff and erosion control measures will require preparation and adherence to a strict Soil Erosion and Sedimentation Control Plan to minimize excessive loss of sediment downstream and into wetlands.

5.3.3 Long-Term Effectiveness and Permanence

Residual Risks – While this Alternative would eliminate the direct contact and inhalation pathways for site users, lead-impacted soils in excess of 400 mg/kg would remain on site. Institutional controls or restrictions regarding future uses of the site would have to be imposed to prevent exposure to workers or others during potentially invasive activities within the buried soil. The long-term effectiveness of the fill area from a structural and landscape viewpoint would be high. Permanent erosion protection measures will be required along the fill embankment facing the Rockaway River floodway.

Environmental Effects – As no impact has been identified as resulting from the current site conditions, no adverse long-term effect from leaving the lead-impacted soils on site is anticipated.

Socioeconomic Issues – Reuse of the lead-impacted soils would reduce the concern for development of a low-lying flood-prone area on the site result and make use of the site for municipal recreation or other end uses more practical.

Irreversible and Irretrievable Commitment of Resources – This alternative should not result in long-term loss of impacted wetland areas on the eastern portions of the site as they lie outside the area of excavation and backfill. A minor but temporary disturbance may occur in the vicinity of the drainage ditch between LEC and Air Products. Critical adjoining habits will be protected during remediation.

Loss of landfill capacity from off-site disposal of the soils will not occur as a result of this alternative.

5.3.4 Reduction of Toxicity, Mobility and Volume

The amount of soil exceeding the 400 mg/kg criterion on site is estimated to be approximately 10,000 cy. This volume would remain on site as a result of implementing Alternative 2. However, the Category A soils to be excavated and reused under this alternative do not exceed SPLP leaching test criteria, and there is no evidence that groundwater beneath the site has been impacted by lead. Surface erosion of the contaminated soils with associated sediment-borne mobility, would be eliminated by the soil cover process option of this alternative.

5.3.5 Short-Term Effectiveness

Alternative 1 will require the movement of a large amount of soil, increasing the potential for inhalation of airborne dusts by site workers and the local community. Dust control measures may be required in both excavation and staging areas.

Tracking of contaminated soils between stockpiling and staging areas, as well as from trucks transporting soils off-site to a disposal facility will also require special measures to reduce the potential for public exposure.

Worker exposure will have to be addressed by utilization of appropriate personal protective gear and institution of appropriate construction worker health and safety plans.

The open excavation will present physical hazards that will require some degree of control and protection.

This alternative may also temporarily disrupt wetlands and river ecosystems in close proximity to the site. Excavating equipment and trucking activities will also provide a noise nuisance to the neighborhood that will require control of working hours.

No risks or nuisance resulting from off-site transportation of the lead-impacted soils would result under this alternative.

5.3.6 Implementability

Technical Feasibility – Excavation and reuse of the lead-impacted soils is technically feasible. It will be difficult excavation with coarse soils, debris and boulders involved. Exposure of the large areas of excavation, particularly in close approximation to the Rockaway River will require installation of effective soil erosion and sedimentation controls to limit the risk of overland flow of contaminants to the Rockaway River and adjacent wetland areas. The low potential for a major flood event during construction should be considered. Effects of a flood would be minimized by protection of stockpile and temporary placement of embankments adjacent to excavated areas.

Availability of Services and Materials – There appear to be no major material or supply limitations to implementation of this alternative. Temporary stockpiling of large volumes of soils and backfill material may require extension of staging areas into sections of the LEC property west of the rails-to-trails corridor. There appears to be sufficient available space within the LEC property for staging and stockpile areas.

Administrative Feasibility – Truck trafficking and staging will require temporary closure of the rails-to-trails area of the site. Permitting of earthwork and related activities within floodplains and wetland areas may incur some administrative delays. There are no long-term institutional controls associated with this alternative.

5.3.7 Costs

The total costs for the combined remedial approach that is inclusive of the items listed in Section 4 for Alternative 2 are $3,215,540 (see Table 4). To simplify cost comparison purposes the costs of process elements related to excavation and beneficial reuse of lead-impacted soils have been broken out to include only those capital costs that are affected by selection of Alternative 2. These costs include:

- Backfilling of Lead-Impacted Soils (10,190 cy)
- Import and Place Clean Backfill (7,777 cy)
- Final Grading and Restoration (1.5 Acres)

Table 6 presents a summary of the costs that total $295,047 for the process elements directly related to Alternative 2. Note that the acreage for restoration in Alternative 2 is less than Alternative 1, because we assume that no topsoil and seeding will be required for the surface of the backfilled terrace.

Section 6
Comparative Analysis of Alternatives

6.1 Purpose

The purpose of the following comparative analysis is to identify the relative advantages and disadvantages of each alternative. These comparative factors are then used, as the basis as selecting which of the alternatives is the preferred alternative. The Alternatives to be compared are:

- **Alternative 1** – Excavation and Off-Site Disposal of Lead-Impacted Soils, and
- **Alternative 2** – Excavation and Beneficial Reuse of Lead-Impacted Soils as Backfill

The analysis involves comparison of the two alternatives using the information derived from detailed analyses of each of the nine criterion as presented in Section 5 of this FFS.

6.2 Overall Protection of Human Health and the Environment

Both Alternative 1 and 2 are protective of human health. Alternative 1 would provide the maximum protection to human health and the environment by permanently removing the lead-impacted to soils to levels below the 400 mg/kg criterion, thereby eliminating exposure pathways, and reducing the potential for office migration. While Alternative 2 would not remove the lead-impacted soils, the area of potential exposure would be reduced by soil consolidation, and protective cover would eliminate the direct-contact exposure pathway.

Inasmuch as SPLP testing has shown that the impacted soils will not leach lead in excess of media specific quality criteria, and because no groundwater impacts have been identified, off-site removal of the soils would not provide additional benefit to groundwater or off-site environmental habitat protection.

Alternative 1 is in conflict with preferred on-site remedial approaches, whereas Alternative 2 would not impact off-site landfill space resources.

6.3 Compliance with ARARS

6.3.1 Chemical-Specific ARARs

Both Alternatives 1 and 2 will meet chemical-specific ARARs.

6.3.2 Location-Specific ARARs

Both Alternatives 1 and 2 will require excavation and restoration in and adjacent to 100-year floodplains and floodways. Controls will be necessary to assure that these flood hazard areas are not permanently obstructed and that the excavation and closure of the site does not exacerbate release of lead-impacted soils to the Rockaway River or adjoining wetlands. Stockpile and equipment staging areas for both alternatives may also be located within the 100–year and New Jersey flood hazard zones.

For Both Alternatives 1 and 2 excavation of soils from adjoining wetland areas will require mitigation. Excavation into the Rockaway River, however, is not necessary, such that provision of erosion and sedimentation controls during remediation should minimize impact to aquatic and wetland species and communities.

Historic Sites identified in the vicinity of the LEC site include the 1889 Ross and Baker Silk Mill located adjacent to the Washington Forge Pond. Neither alternative is anticipated to have an adverse effect on the Silk Mill.

6.3.3 Action-Specific ARARs

Excavation of soils and transfer of soils involved in both Alternative 1 and 2 may result in generation of lead-laden airborne dust. Dust control measures will be necessary to maintain compliance with emissions standards. Under both alternatives, stockpiling of Category A , Category B and Category C soils will require segregation to prevent contamination of specific soils with soils having a different waste classification.

6.4 Long-Term Effectiveness and Permanence

6.4.1 Residual Risks

As Alternative 1 would permanently transfer all soils exceeding the 400 mg/kg criterion from the LEC site, the long-term effectiveness of this alternative to reduce on-site human health risks would be somewhat higher than Alternative 2. No institutional controls or restrictions regarding use of the site would have to be imposed under Alternative 1 due to the absence of lead, whereas Alternative 2 would require those controls.

6.4.2 Environmental Effects

Neither Alternative 1 nor 2 would result in an adverse impact to long-term environmental benefits. Since no off-site impacts are anticipated from leaving lead-impacted soils on site, Alternative 1 would provide no greater improvement to environmental impacts than would Alternative 2.

6.4.3 Socioeconomic Issues

Alternative 1 calls for excessive volumes of lead-impacted soil to be removed from the site. Compared to Alternative 2, this may result in an low-lying area or area susceptible to flooding, and may impact the uses and feasibility of the municipal end-use plan.

6.4.4 Irreversible and Irretrievable Commitment of Resources

Both Alternatives 1 and 2 may result in encroachment on wetland immediately adjacent to the site. These habitats are identified in Section 4.8.

Alternative 1 will result in a substantial loss of landfill capacity.

6.5 Reduction of Toxicity, Mobility and Volume

Neither Alternative 1 nor Alternative 2 will reduce the toxicity or mobility of lead-impacted soils.

Alternative 1 would eliminate from the site 10,190 cy of soil exceeding the 400 mg/kg lead criterion. As the material would be removed in-total, the risk from leaching would be eliminated. However, this risk is already low, as evidenced by the results of SPLP leaching tests and groundwater testing.

Alternative 1 would eliminate the risk of surface soil erosion and off-site migration of lead-impacted soils, whereas, Alternative 2 would require erosion protection measures.

Neither of these alternatives meets the statutory preference for treatment.

6.6 Short-Term Effectiveness

Both Alternatives 1 and 2 presents risks for release of lead-impacted airborne dust and tracked soils during excavation and on-site transport and stockpiling. Equipment operations for both alternatives will create a noise nuisance in the area. Both alternatives have the potential to temporarily disrupt adjacent wetlands and ecosystems.

Both alternatives will have to be address appropriate construction worker health and safety plans for exposure as well as excavation safety.

Alternative 1 will present a major temporary increase in truck traffic compared to Alternative 2, as an additional 1,000 truck loads of soil would have to be transported off-site under this alternative.

6.7 Implementability

Technical Feasibility – Remediation is technically feasible under both Alternatives 1 and 2, provided a major flood event is avoided during remediation efforts.

Availability of Services and Materials – There appear to be no major material or supply limitations to implementation of this alternative. Alternative 1 will require substantially more trucking capacity than Alternative 2. Alternative 2 will require more stockpile space than Alternative 1.

Administrative Feasibility – Both Alternatives will require temporary closure of the rails-to-trails area of the site and implementation of strict traffic control procedures. Permitting of earthwork and related activities within floodplains and wetland areas may incur some administrative delays. Unlike Alternative 1, Alternative 2 will require long-term institutional controls to maintain integrity of the cover over the backfilled lead-impacted soils.

6.8 Costs

The total estimated cost for the Alternative 1 remedial approach is $3,777,960, while the total estimated cost for Alternative 2 is $3,215,540. To simplify cost comparisons the detailed evaluation in Section 5 broke out those capital cost items that are strictly related to the remedial process elements affected by selection of either Alternative 1 or Alternative 2. These costs elements and related costs specific to the 2 alternatives are summarized in Tables 5 and 6. The cost of process elements directly related to Alternatives 1 and 2 are $998,073 and $295,047, respectively. The difference in cost is substantial — $703,025 (see Table 7) — and shows that off-site disposal of the lead-impacted soils is much more costly than beneficial reuse.

Section 7
Risk-Cost-Benefit Analysis

The comparative analysis of Alternatives 1 and 2 performed in Section 6 indicates that both Alternatives achieve the goal of eliminating the risk of direct contact of lead-impacted soils. As the lead-impacted soils on site have not been shown to impact off-site ecosystems or to threaten groundwater supplies under existing site conditions, no further benefit from reduction in site risks or elimination of off-site exposure pathways can be achieved by either Alternative.

The benefits of removal of the lead source from the site would be countered by the transportation risks of trucking those soils to an off-site facility and the transfer of the lead source risks to that facility. The residual risks to utility or construction workers from digging beneath the soil cap would be mitigated by the establishment of deed restrictions and the installation of utility corridors during remediation. Therefore, no clear advantage in risk-benefit can be established by the implementation of either Alternative such that a common risk-benefit ratio of unity (1.0) can be assigned to both.

Given the cost differences between the process elements involved in Alternatives 1 and 2, Alternative 1 provides the same risk-benefit as Alternative 2 but at a cost 3.4 times the cost of Alternative 2. Using Alternative 1 as the baseline alternative, Alternative 2 provides a risk-cost-benefit value 3.4 times greater than Alternative 1. Therefore Alternative 2, On-Site Beneficial Reuse of the Lead-Impacted Soils, is the preferred alternative.

Tables

Table 1
Materials From On-Site Excavation Activities
L.E. Carpenter and Company Wharton New Jersey NJD002168748

MATERIAL CATEGORY	MATERIAL NAME	DESCRIPTION	CLASSIFICATION (HAZARDOUS, NON-HAZARDOUS, ID-27 RUBBLE)	APPROXIMATE QUANTITY (YD^3 UNLESS SPECIFIED)	DISPOSITION
A	Overburden soil, fill and debris from excavation area	Soil, debris, and fill material. Soil with Pb concentrations >400 mg/kg but not TCLP hazardous for Pb. This is overburden excavated above the Free-product smear zone. This category includes the ID-27 debris generated as the result of Bldg 13 and 14 demolition activities, the 20,000 sqft former Bldg 14 foundation slab, and the 5,000 sqft concrete slab thought to exist within the former AST area, approximately 10 ft bgs. Both slabs are considered ID-27 Rubble.	Non-hazardous(1)(5)(7)	10,190	On-site management and reuse as sub-grade fill material
B	Paint sludge/multi-colored to tan process waste material and associated soils	Brightly multicolored sludge & putty with haz. levels of Pd, Cd, and organics. Waste stream located in a former infiltration gallery located adjacent to the former AST area, in the old piping gallery between the former AST area and mfg. Bldg. 14.	Hazardous D006, D008	778	Off-site treatment and disposal
C	Upper-layer soils, fill and debris	Material with Pb concentrations <400 mg/kg excavated outside of the lead soil contaminant zone only to expose the underlying free product smear zone soils.	Non-hazardous(7)	3,378	On-site management and reuse as sub-grade fill material and/or thin spread material
D	Free-product smear zone soil	Organic chemical-impacted soils "smeared" with Free-product layer but containing no free liquids. Materials proposed for excavation from two predetermined depths 1) the top of the product smear zone and 2) to a depth below the water table where product may exist due to historically low water table elevation.	Non-hazardous(2)	4,953	Off-site disposal as non-hazardous industrial waste
E	Copper contaminated soil	Green-colored process waste soil and sludge discovered between Bldg. 12 and penstock outlet on the Rockaway River. Soil concentrations were 137 mg/L Cu and 0.7 mg/L Pb.	Non-hazardous	100	Off-site disposal as non-hazardous waste
F	Free-product layer-liquid	Organic solvent- hazardous ignitable liquid with a high concentration of xylene removed from groundwater in wet excavation area.	Hazardous F003 (6)	4,700 - 9,700 gal (3)	Off-site treatment and disposal
G	Absorbent pads containing free product material	Absorbent material (pads, booms, skimmers, or similar absorbent aids) containing free-product waste. Generated from removing residual free-product from groundwater not collected by pumping. Initial characterization is non-hazardous.	Non-hazardous(4)	2 - 10 (based on 10% of free-product layer assumed left from pumping.	Off-site treatment and disposal

Table 1
Materials From On-Site Excavation Activities
L.E. Carpenter and Company Wharton New Jersey NJD002168748

MATERIAL CATEGORY	MATERIAL NAME	DESCRIPTION	CLASSIFICATION (HAZARDOUS, NON-HAZARDOUS, ID-27 RUBBLE)	APPROXIMATE QUANTITY (YD^3 UNLESS SPECIFIED)	DISPOSITION
H	Miscellaneous Construction debris	Other potential concrete slabs, footers, mason blocks, piping, etc.	ID-27 Rubble(5)(9)	100 - 300 (upper level quantity unknown	Off-site disposal in a construction debris landfill
I	Construction debris "cleaning" residual	Visual inspection of construction debris may show a portion of the stream needs removal of hazardous material (free product). Construction debris "cleaning" residual material (i.e. washwater) would be generated during cleaning of contaminated debris.	Hazardous Wash Waters (gal)(6)(8)	2000 gal.	Off-site treatment and disposal
J	PCB Soils	Soils located in the Wharton enterprise property exhibiting a PCB concentration greater than the site-specific cleanup criteria of 2 mg/kg. Weston delineated an area of 11,850 sqft in Dec 1993. This remedial approach was documented in the report entitled Workplan for Phase I ROD Implementation (Weston, Oct 1994). Excavation volume based on removal of 11,850 sqft of soils to a maximum of 2ft (depth of static water table).	Non -Hazardous (assumed - will characterize waste at time of generation)	900	Off-site disposal as non-hazardous waste

Notes

1. The non-hazardous determination is based on historical waste classification sampling performed by Roy F. Weston (December 1994) on inorganic impacted soils excavated from Hot Spot A,B,C, and D as presented in their letter to the NJDEP dated January 11, 1995. The NJDEP agreed with the non-hazardous determination in the letters dated February 28, 1995 and August 9, 1995 and subsequently not subject to land ban.
2. Non-hazardous classification assumes that the soils, once free liquids are removed prior to characterization, will not be considered characteristically hazardous.
3. Free product volumetric range based upon anticipated recoverable volume of product outlined in Free Product Volume Analysis (RMT, 2000) minus the collected volume to date of approximately 3,300 gallons. Assume total extraction volume of 25,000 gallons (free product w/groundwater emulsion).
4. Non-hazardous classification assumes that the absorbent pads not exhibiting the characteristic of ignitability.
5. ID-27 Rubble determination provided by the NJDEP to backfill material into the Bldg. 14 foundation in their letter dated February 28, 1995.
6. Assume treatment and disposal remains consistent with EFR fluid management from Nov 1997 to present.
7. If offsite management scenario as a non-hazardous industrial waste is required, this volume will be reduced by 60% as material will be screened and separated (i.e. fill, concrete) and concrete classified as an ID-27 Rubble.
8. Construction debris "cleaning" residual volumes are assumed to be 2000 gallons of wash/decon waters.
9. Off site disposal volume assumed to be 200 cu yds.
10. This table has been slightly modified from Table 8 presented in the *Findings & Recommendations Regarding a Conceptual Free-Product Remediation Strategy* (RMT, March 2002) to match the volume estimates presented in this FFS.

Table 2
L.E. Carpenter & Company, Wharton, NJ
Lead Soil Focused Feasibility Study (FFS)
Applicable or Relevant and Appropriate Requirements (ARARS) And To Be Considered (TBC) Material

POTENTIAL ARARS AND TBCS	CITATION OR REFERENCE	APPLICABILITY	SUMMARY OF REQUIREMENTS
LOCATION-SPECIFIC			
Freshwater Wetlands Protection Act	N.J.S.A. 13:9B [Rules N.J.A.C. 7:7A]	ARAR	Protection of freshwater wetlands, transitional areas or "buffers", lakes, ponds, rivers or streams from any disturbance or destruction of water level, soil or vegetation such as by draining, filling and/or clearing.
Flood Hazard Area Control Act & Executive Order 11988 entitled "Floodplain Management" dated May 24, 1977	N.J.S.A. 58:16A [Rules at N.J.A.C. 7:13] & 40 CFR Part 6	ARAR	Protection of freshwater wetlands, transitional areas or "buffers", lakes, ponds, rivers or streams from any construction activity or human land disturbance, such as placement of structures or fill, excavation, dredging
Protection of Wetlands	Executive Order 11990, 42 FR 26961	ARAR	Requires minimization of destruction, loss, or degradation of wetlands.
National Historic Preservation Act of 1966 & New Jersey Register of Historic Places Act	7 CFR 650 & 36 CFR 800 & N.J.S.A. 13:1B-15.128 et seq [N.J.A.C 7:4]	ARAR	Establishes requirements for determining a sites eligibility for listing in the National Register of Historic Places. NJ rules of the Department of Environmental Protection concerning the preservation of the State's historic, architectural, archaeological, engineering, and cultural heritage.
Endangered Species Act of 1973 & Flood Hazard Area Control Act [*General Environmental Standards*]	16 USC 1531 et seq. 50 CFR 402 & [Rules at N.J.A.C. 7:13-3.9]	ARAR	Establishes requirements to protect species threatened by extinction and habitats critical to their survival
Endangered Plant Species List Act	13:1B-15.151 to -15.158 [Rules N.J.A.C 7:5C]	TBC	NJ threatened plant species list.
ACTION-SPECIFIC			
Resource Conservation & Recovery Act (RCRA)	40 CFR 261, 261, 262, 263, & 268 & [Rules N.J.A.C 7:26G]	ARAR	Federal and State regulation governing the generation, evaluation, transportation and disposal of solid and hazardous wastes
Subsurface and Percolating Waters Act	N.J.S.A. 58:4A-4.1 & N.J.A.C 7:9D	ARAR	Water Pollution Control: Well Construction And Maintenance; Sealing Of Abandoned Wells
Noise Pollution and Abatement Act of 1970 & Noise Control Act of 1971	42 USCS 7641, 7642, N.J.S.A.13:1 G-1 to -23 N.J.A.C 7:29	ARAR	Noise standards, performance and testing for remedial actions that may cause noise. 50 decibels during nighttime (10:00 p.m. to 7:00 a.m.) and 65 decibels during daytime.
Air Pollution Control Act (1954)	N.J.A.C 7:27	ARAR	Ambient air monitoring and particulate [dust] control
Storm Water Management Act of 1981	N.J.A.C 7:8	ARAR	Stormwater runoff management form non-point sources
New Jersey Water Pollution Control Act & Water Quality Planning Act	N.J.S.A. 58:10A-1 & N.J.S.A. 58:11A-1	ARAR	Classification of surface waters of the State, procedures for establishing water quality-based effluent limitations, modification of water quality-based effluent limitations, procedures for reclassifying specific segments for less restrictive uses and procedures for reclassifying specific segments for more restrictive uses

Table 2
L.E. Carpenter & Company, Wharton, NJ
Lead Soil Focused Feasibility Study (FFS)
Applicable or Relevant and Appropriate Requirements (ARARS) And To Be Considered (TBC) Material

POTENTIAL ARARS AND TBCS	CITATION OR REFERENCE	APPLICABILITY	SUMMARY OF REQUIREMENTS
Air Monitoring during Excavation	EPA-450/4-90-014 Jul 1990	TBC	Procedures for evaluating the air impacts of soil excavation associated with Superfund remedial actions
Estimation of Air Impacts for the excavation of Contaminated Soil	EPA-450/1-92-004 Mar. 1992	TBC	Evaluation of emissions from soil excavation
Soil and Sediment Erosion Control Act of 1975	N.J.S.A 4:24-39 to -55 [Rules at N.J.A.C.7:13-3.3 & 3.5]	ARAR	Established rules to prevent sediment loading of downstream waterways or water bodies in general and projects along trout associated watercourses
Occupational Safety and Health Act of 1970 [Construction Work]	29 CFR 1910.120 29 CFR 1910.1025 29 CFR 1910 Subpart I 29 CFR 1910.95 29 CFR 1910 Subpart P 29 CFR 1910.1200 49 CFR Parts 100-185 29 CFR 1926 N.J.A.C 5:17	ARARs	Hazardous Waste Operations (HAZWOPER) Lead Personal Protective Equipment Occupational Noise Exposure Hand and Portable Powered Tools and Hand Held Equipment Hazard Communication Transportation of Hazardous Materials Safety and Health Regulations for Construction Lead Hazard Evaluation and Abatement Code
New Jersey Technical Requirements for Site Remediation	N.J.A.C 7:26E	ARAR	Establishes the minimum technical requirements that form the basis of the NJDEPs review of the remediation of any contaminated site in New Jersey, including those sites and activities subject to CERCLA
New Jersey Stormwater Best Management Practices Manual	January 2003 Draft [N.J.A.C 7:8]	TBC	Guidance manual addressing best management practices (BMPs) for Stormwater Management Plans
Prevention and Control of Discharges at Major Facilities	7:1E-2	TBC	ASTs and secondary containment
CHEMICAL-SPECIFIC			
USEPA. 1994. Guidance Manual for the Integrated Exposure Uptake Biokinetic Model for Lead in Children	EPA/540/R-93/081, PB93-963510.	TBC	Risk that estimates the relationship between environmental lead and that of fetal blood concentrations. that estimates the relationship between environmental lead and that of fetal blood concentrations.
Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil.	USEPA. 1996.	TBC	Lead risk evaluation guidance document
Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities (August 1994)	EPA/540/F-94/043, OSWER 9355.4-12	TBC	Determine protective levels for leqad in soils at superfund sites

Table 2
L.E. Carpenter & Company, Wharton, NJ
Lead Soil Focused Feasibility Study (FFS)
Applicable or Relevant and Appropriate Requirements (ARARS) And To Be Considered (TBC) Material

POTENTIAL ARARS AND TBCS	CITATION OR REFERENCE	APPLICABILITY	SUMMARY OF REQUIREMENTS
New Jersey Surface Water Quality Standards	N.J.A.C. 7:9B-1.14	ARAR	**5 ug/L** [total recoverable] Lead Surface Water Quality Criteria: Noncarcinogenic effect-based human health criteria as a 30-day average with no frequency of exceedance at or above the design flows specified in section N.J.A.C. 7:9B-1.5(c)2
New Jersey Groundwater Quality Standards	N.J.A.C. 7:9-6	ARAR	**5 ug/L** [total recoverable] Lead Groundwater Quality Criteria - IIA
ROD Cleanup Criteria for Lead Soil	1994 LEC ROD	ARAR	**600 mg/kg** - Site Specific Risk Based Cleanup Objective based on Industrial Commercial Exposure
Cleanup Standards for Contaminated Sites,	N.J.A.C. 7:26D	ARAR	**400 mg/kg** Residential Direct Contact Soil Cleanup Criteria. Criterion based on the USEPA Integrated Exposure Uptake Biokinetic (IEUBK) model utilizing the default parameters. The concentration is considered to protect 95% of target population (children) at a blood lead level of 10 ug/dl.
Occupational Health and Environmental Controls	Title 29, Part 1926, Subpart D	ARAR	**8-Hour Time Weighted Average of 50 ug/m^3** Applies to all construction work where an employee may be occupationally exposed to lead. All construction work excluded from coverage in the general industry standard for lead by 29 CFR 1910.1025(a)(2) is covered by this standard

Table 3
L.E. Carpenter & Company
Alternative 1 - Opinion of Probable Price
Site Remediation with Off-Site Disposal of Lead-Contaminated Soils

	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL 2004 COST
1	Administrative Restrictions and Institutional Controls	1	LS	$23,350	$23,350
2	Health and Safety	1	LS	$103,500	$103,500
3	Well Abandonment	28	EA	$874	$24,472
4	Well Replacement	10	EA	$3,470	$34,700
5	Mobilization	1	LS	$125,000	$125,000
6	Clear and Grub	2	ACRE	$3,845	$7,690
7	Excavate and stockpile lead-contaminated Category A Soils	10,190	CY	$20.57	$209,608
8	Transport and off-site dispose lead-contaminated Category A Soils	10,190	CY	$69.94	$712,689
9	Excavate and off-site dispose as hazardous waste Category B soils	778	CY	$291	$226,498
10	Excavate and stockpile non contaminated Category C soils	3,378	CY	$12.51	$42,259
11	Excavate and screen free-product contaminated Category D soils	10,133	CY	$58	$590,045
12	Off-site dispose screened free-product contaminated Category D soils	4,953	CY	$200	$990,600
13	Replace clean stockpiled Category C soil as backfill	3,378	CY	$10.00	$33,780
14	Import and place clean backfill	3,264	CY	$14.85	$48,470
15	Topsoil, seed and mulch	3	ACRE	$12,433	$37,299
16	Demobilization and cleanup of staging areas	1	LS	$53,000	$53,000
	SUBTOTAL				**$3,262,960**
17	ENGINEERING & CONSULTING				515,000
	ALTERNATE 1 TOTAL				**$3,777,960**

NOTES:

1 Costs from preceding year were adjusted to reflect 2004 construction costs utilizing the Gross Domestic Product Inflation Model.
2 All soil quantities are based upon in place cubic yards.
3 Costs are not representative of the inflationary costs associated with and materials that are fuel cost dependent. Fuel dependent items include but are not limited to aggregate, soils, hydraulic oils and lubricants, etc.
4 Accuracy of costs is +50/-30percent.
5 Assumes that lead stabilization of stockpiled soils is not required.
6 Cost assume level D personal protective equipment (PPE) will be utilized
7 Costs assume that the Category B process waste will not require incineration to meet Universal Treatment Standards (UTS)
8 Cost assume that LEC will provide construction support facilities (*i.e.*, office, shower, bathrooms, changing area etc.)
9 Beneficial reuse as of aggregate materials generated from building demolition on the west portion of the site as general fill could lower clean fill import costs
10 Final cost associated with disposal of Category D soils will be dependent on final treatability analysis for waste characteristics

Table 4
L.E. Carpenter & Company
Alternative 2 - Opinion of Probable Price
Site Remediation with On-Site Beneficial Reuse of Lead-Contaminated Soils

	DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL 2004 COST
1	Administrative Restrictions and Institutional Controls	1	LS	$23,350	$23,350
2	Health and Safety	1	LS	$103,500	$103,500
3	Well Abandonment	28	EA	$874	$24,472
4	Well Replacement	10	EA	$3,470	$34,700
5	Mobilization	1	LS	$125,000	$125,000
6	Clear and Grub	2	ACRE	$3,845	$7,690
7	Excavate and stockpile lead-contaminated Category A Soils	10,190	CY	$20.57	$209,608
8	Replace stockpiled Category A soils as backfill	10,190	CY	$10.00	$101,900
9	Excavate and off-site dispose as hazardous waste Category B soils	778	CY	$291	$226,498
10	Excavate and stockpile non contaminated Category C soils	3,378	CY	$12.51	$42,259
11	Excavate and screen free-product contaminated Category D soils	10,133	CY	$58	$590,045
12	Off-site dispose screened free-product contaminated Category D soils	4,953	CY	$200	$990,600
13	Replace clean stockpiled Category C soil as backfill	3,378	CY	$10.00	$33,780
14	Import and place clean backfill and cover material	7,777	CY	$14.85	$115,488
15	Topsoil, seed and mulch	1.5	ACRE	$12,433	$18,650
16	Demobilization and cleanup of staging areas	1	LS	$53,000	$53,000
	SUBTOTAL				**$2,700,540**
17	ENGINEERING & CONSULTING				515,000
	ALTERNATE 1 TOTAL				**$3,215,540**

NOTES:

1 Costs from preceding year were adjusted to reflect 2004 construction costs utilizing the Gross Domestic Product Inflation Model.
2 All soil quantities are based upon in place cubic yards.
3 Costs are not representative of the inflationary costs associated with and materials that are fuel cost dependent. Fuel dependent items include but are not limited to aggregate, soils, hydraulic oils and lubricants, etc.
4 Accuracy of costs is +50/-30percent.
5 Assumes that lead stabilization of stockpiled soils is not required.
6 Cost assume level D personal protective equipment (PPE) will be utilized
7 Costs assume that the Category B process waste will not require incineration to meet Universal Treatment Standards (UTS)
8 Cost assume that LEC will provide construction support facilities (*i.e.,* office, shower, bathrooms, changing area etc.)
9 Beneficial reuse as of aggregate materials generated from building demolition on the west portion of the site as general fill could lower clean fill import costs
10 Final cost associated with disposal of Category D soils will be dependent on final treatability analysis for waste characteristics

Table 5
Cost of Alternate Dependent Process Elements
ALTERNATIVE 1

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
Transport and off-site dispose lead-contaminated Category A Soils	10,190	CY	$69.94	$712,689
Import and place clean backfill	3,264	CY	$14.85	$48,470
Topsoil, seed and mulch	3	ACRE	$12,433	$37,299
			SUBTOTAL	$798,458
ENGINEERING & CONSULTING (25% of Subtotal)			25%	199,615
			TOTAL	$998,073

Table 6
Cost of Alternate Dependent Process Elements
ALTERNATIVE 2

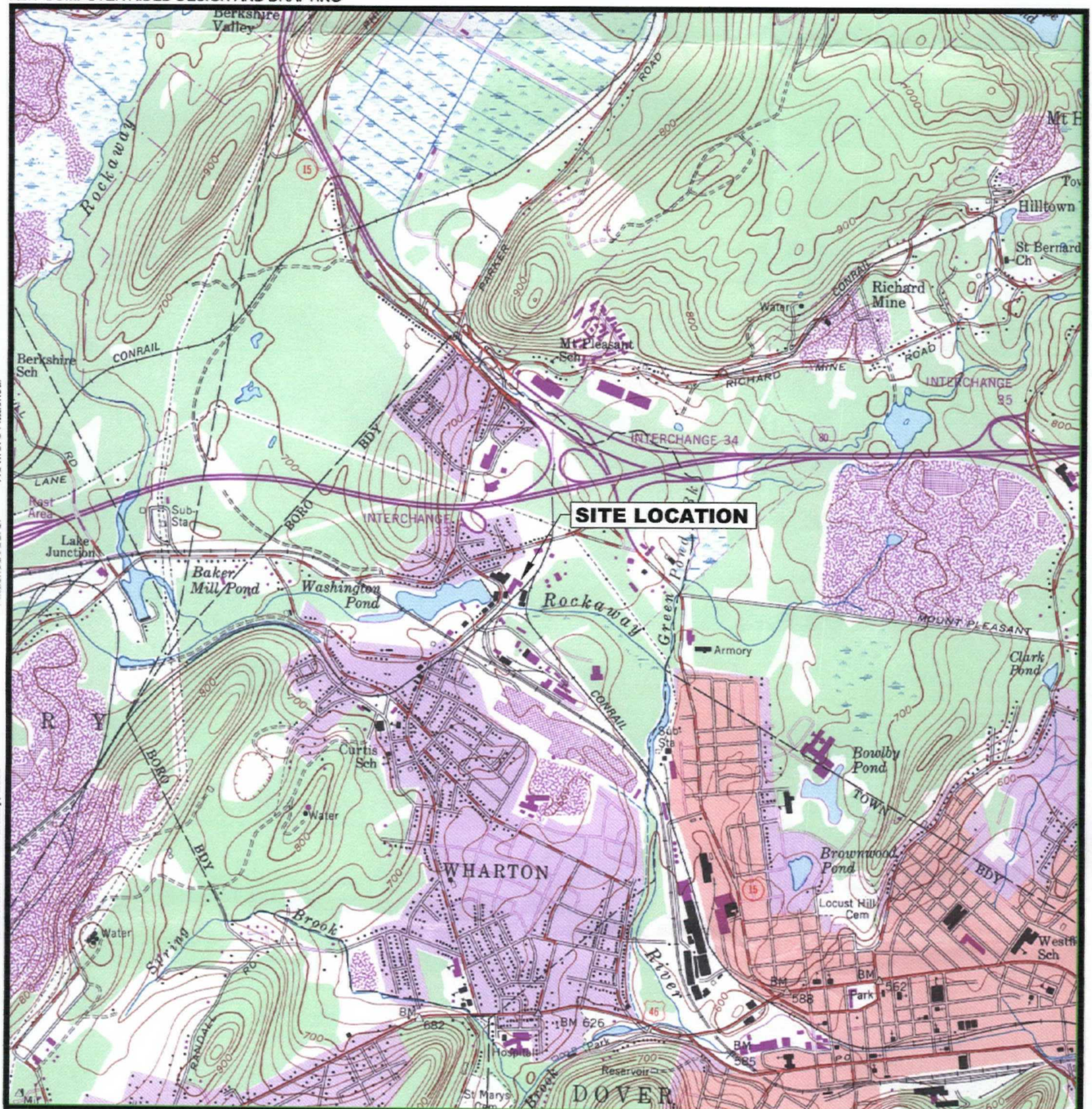
DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL COST
Replace stockpiled Category A soils as backfill	10,190	CY	$10.00	$101,900
Import and place clean backfill and cover material	7,777	CY	$14.85	$115,488
Topsoil, seed and mulch	1.5	ACRE	$12,433	$18,650
			SUBTOTAL	$236,038
ENGINEERING & CONSULTING (25% of Subtotal)			25%	59,009
			TOTAL	$295,047

Table 7
Comparison of Alternative Costs

DESCRIPTION	Alternative 1 TOTAL COST	Alternative 2 TOTAL COST
Off-Site Transport or Backfill Soils	$712,689	$101,900
Import and place clean backfill	$48,470	$115,488
Topsoil, seed and mulch	$37,299	$18,650
Subtotal	**$798,458**	**$236,038**
ENGINEERING & CONSULTING (25% of Subtotal)	199,615	59,009
TOTALS	**$998,073**	**$295,047**
COST DIFFERENTIAL	**($703,025)**	

Figures

RMT COMPUTER AIDED DESIGN AND DRAFTING



NEW JERSEY

QUADRANGLE LOCATION

N

0 2000' 4000'

APPROXIMATE SCALE IN FEET

SOURCE

BASE MAP DEVELOPED FROM THE DOVER, NEW JERSEY 7.5 MINUTE U.S.G.S. TOPOGRAPHIC QUADRANGLE MAP, DATED 1954, PHOTOREVISED 1981.

RMT INC.®	LE CARPENTER WHARTON, NEW JERSEY	DRAWN BY:	SJL
		APPROVED BY:	JDD
	LOCATION PLAN	PROJECT NUMBER:	3868.34
		FILE NUMBER:	38683401.DWG
		DATE:	FEBRUARY 2003

FIGURE 1

PLOT DATA
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RMT COMPUTER AIDED DESIGN AND DRAFTING

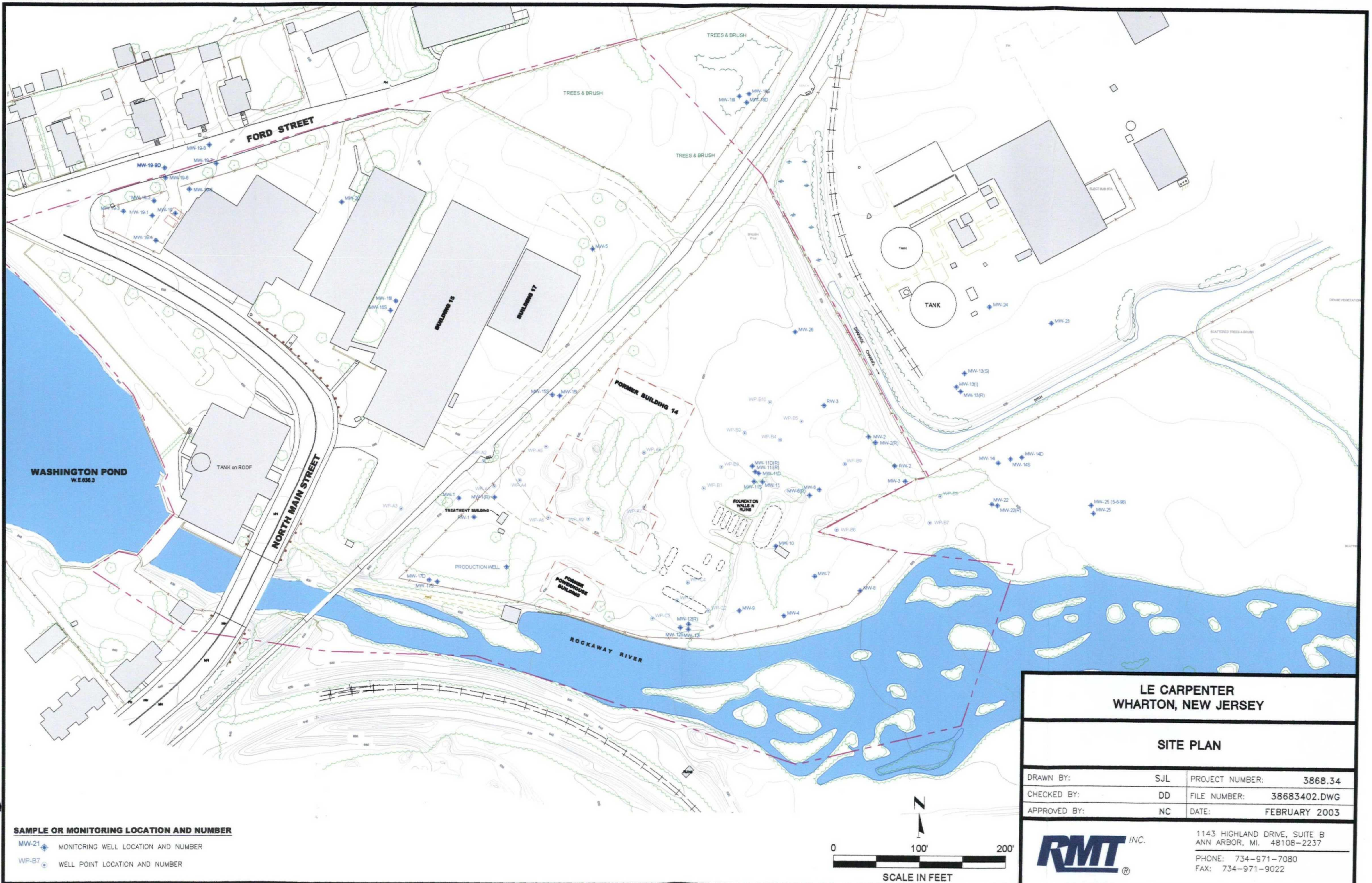

FIGURE 2

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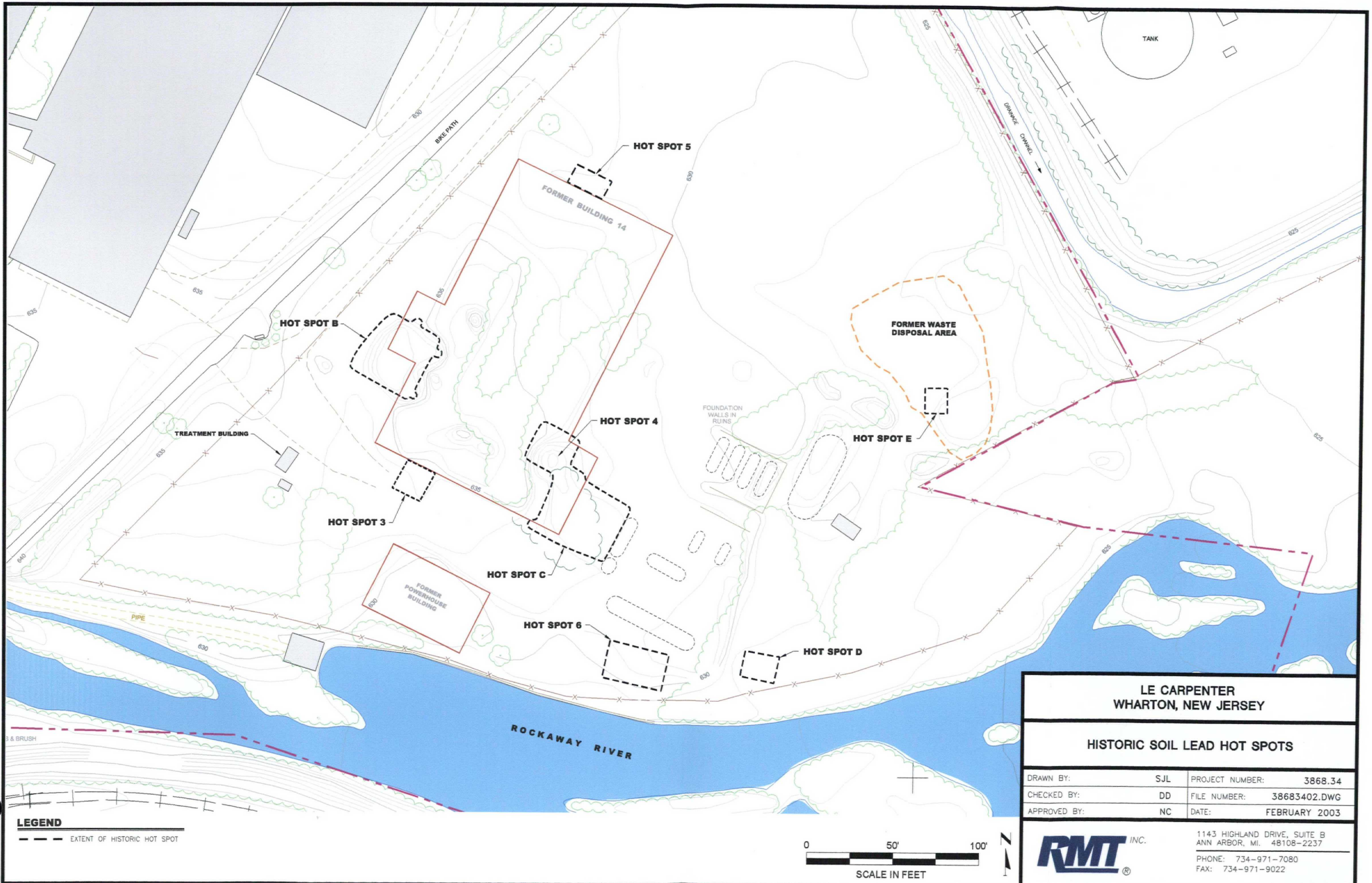
Attached Xref's: No xref's Attached.

RMT COMPUTER AIDED DESIGN AND DRAFTING



LE CARPENTER
WHARTON, NEW JERSEY

HISTORIC SOIL LEAD HOT SPOTS

DRAWN BY:	SJL	PROJECT NUMBER:	3868.34
CHECKED BY:	DD	FILE NUMBER:	38683402.DWG
APPROVED BY:	NC	DATE:	FEBRUARY 2003

RMT INC.
1143 HIGHLAND DRIVE, SUITE B
ANN ARBOR, MI. 48108-2237
PHONE: 734-971-7080
FAX: 734-971-9022

FIGURE 3

PLOT DATA
Drawing Name: ...\03868\28\38682810.dwg
Operator Name: ...dos
Scale: ...30'
Dwg Size: 356939 Bytes
Plot Date: Monday, February 18, 2002
Plot Time: 07:52.0358 AM
Attached Xref's: No xref's Attached.

RMT COMPUTER AIDED DESIGN AND DRAFTING

LEGEND

ROLLER / ICE HOCKEY RINK

TENNIS COURT

BASKETBALL COURT

HORSESHOE PITS

MAP SOURCE

1. BASE MAP DEVELOPED FROM TOPOGRAPHIC SURVEY PROVIDED BY JAMES M. STEWART, INC. LAND SURVEYORS, DRAWING NO 2793-03.DWG, DATED 02-14-02.

0 100' 200'
SCALE IN FEET

LE CARPENTER
WHARTON, NEW JERSEY

CONCEPTUAL END-USE PLAN

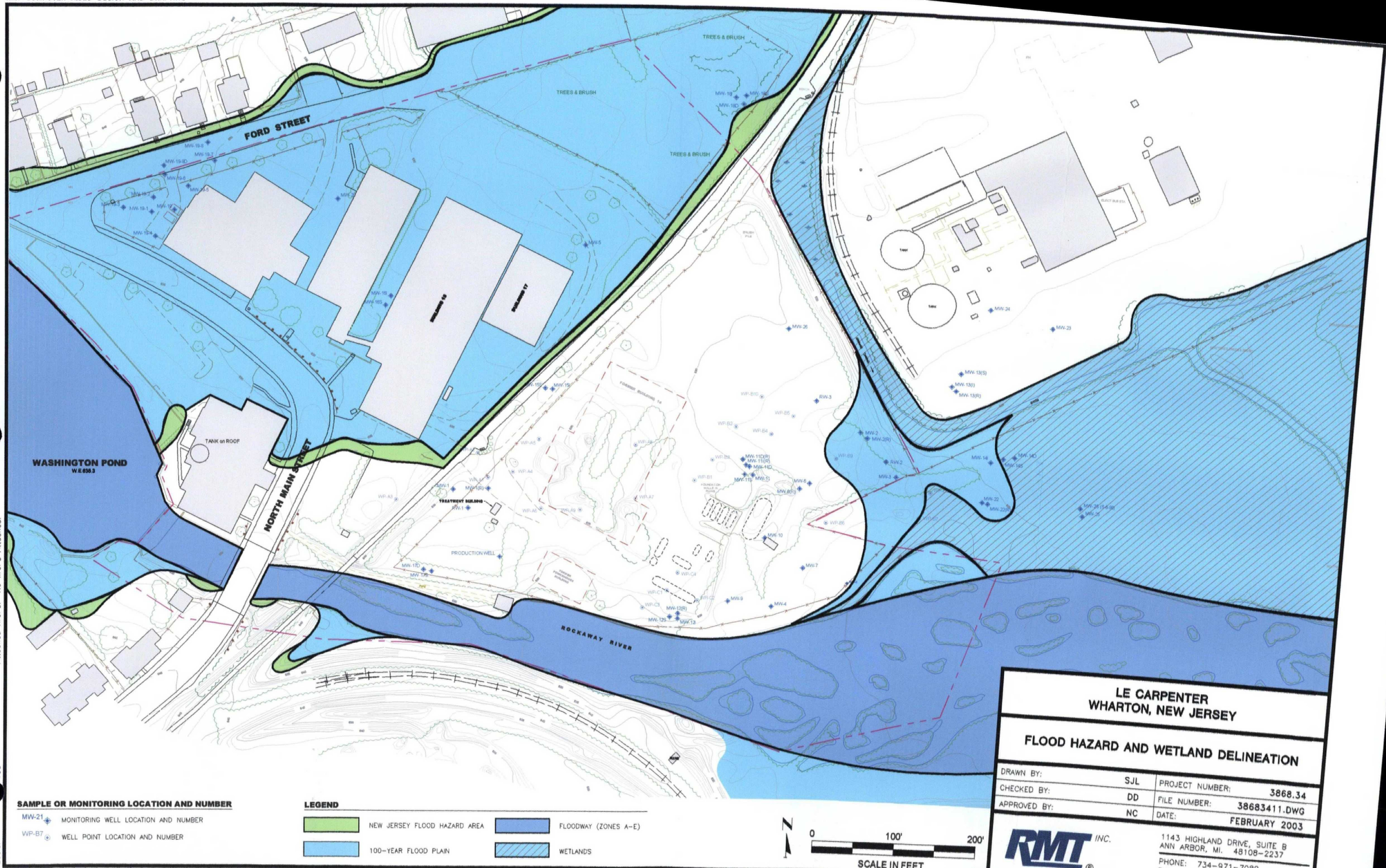
DRAWN BY:	SJL	PROJECT NUMBER:	3868.34
CHECKED BY:	DD	FILE NUMBER:	38683404.DWG
APPROVED BY:	NC	DATE:	FEBRUARY 2003

RMT INC.
1143 HIGHLAND DRIVE, SUITE B
ANN ARBOR, MI. 48108-2237
PHONE: 734-971-7080
FAX: 734-971-9022

FIGURE 4

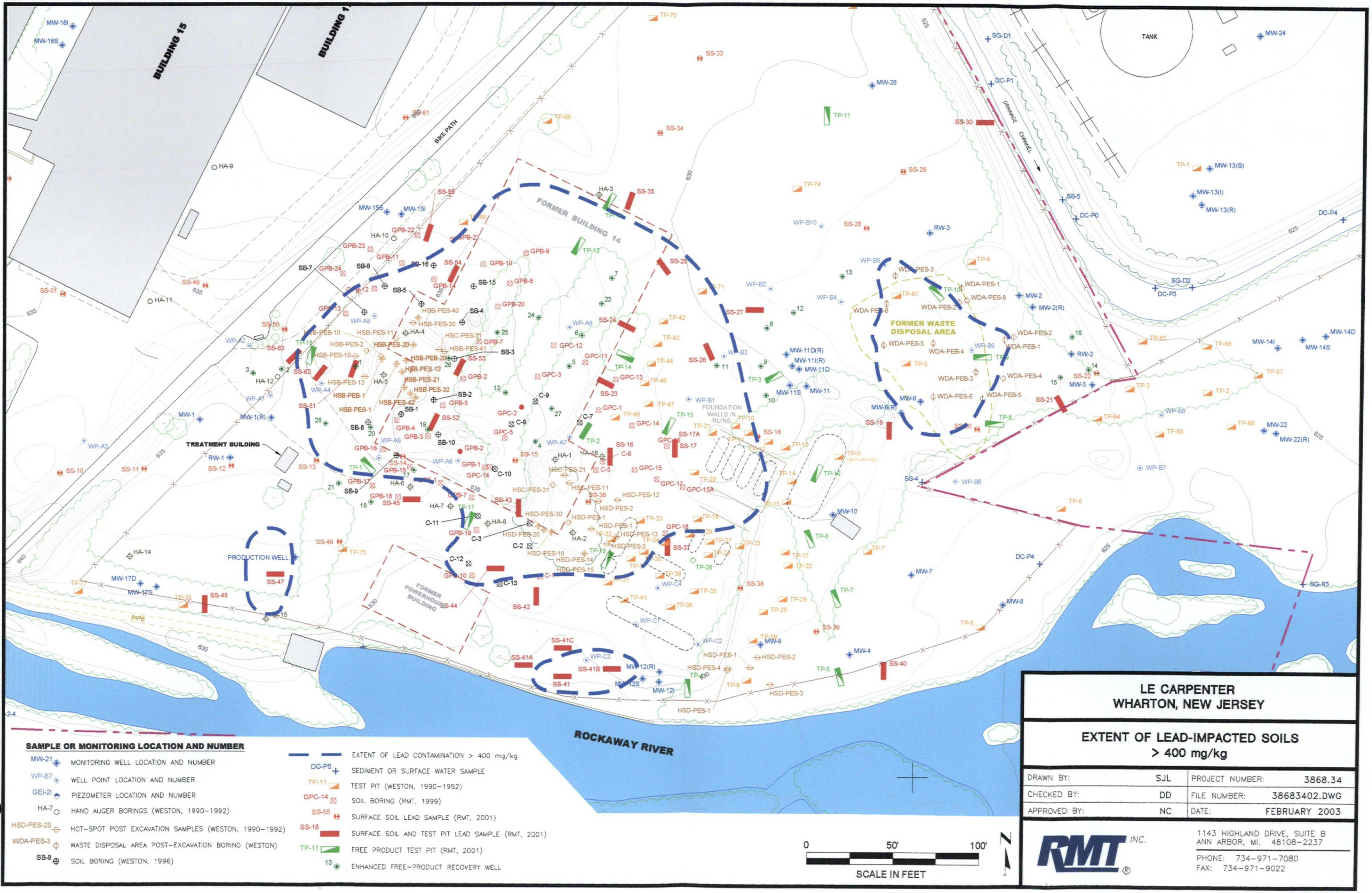
PLOT DATA
Drawing Name: J:\03868\28\38682810.dwg
Operator Name: SJL
Scale: 1"=100'
Dwg Size: 356939 Bytes
Plot Date: February 2003
Plot Time: 07:52.0358 AM
Attached Xref's: No xref's Attached.

RMT COMPUTER AIDED DESIGN AND DRAFTING



PLOT DATA
Drawing Name: \\03868\34\38683411.dwg
Operator Name:
Scale: 1"=100'
Dwg Size: 1428831 Bytes
Plot Date: February 2003
Plot Time: 2:23.2875 PM
Attached Xref's: No xref's Attached.

RMT COMPUTER AIDED DESIGN AND DRAFTING



LE CARPENTER
WHARTON, NEW JERSEY

EXTENT OF LEAD-IMPACTED SOILS
> 400 mg/kg

DRAWN BY:	SJL	PROJECT NUMBER:	3868.34
CHECKED BY:	DD	FILE NUMBER:	38683402.DWG
APPROVED BY:	NC	DATE:	FEBRUARY 2003

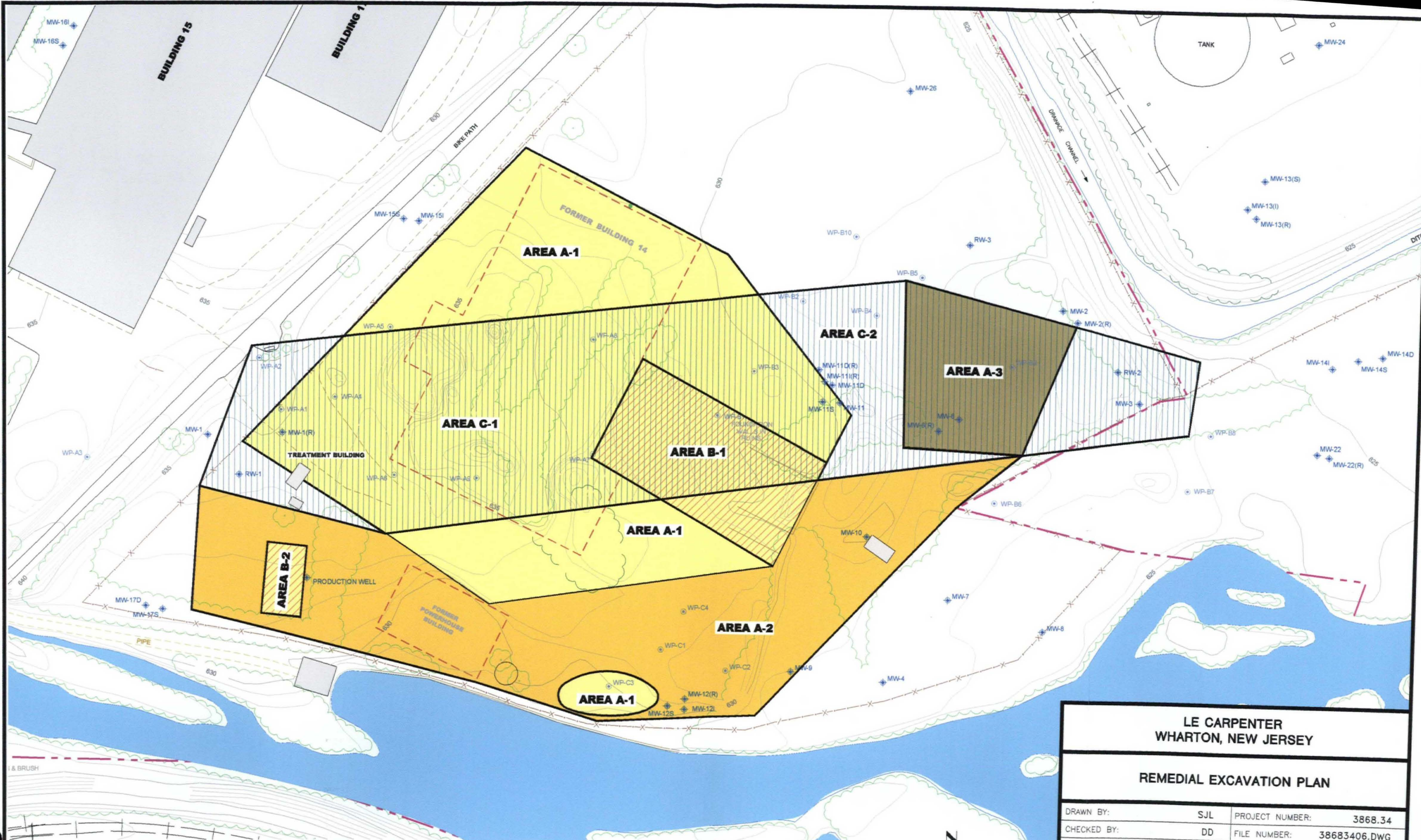
RMT INC.

1143 HIGHLAND DRIVE, SUITE B
ANN ARBOR, MI. 48108-2237
PHONE: 734-971-7080
FAX: 734-971-9022

FIGURE 6

PLOT DATA
Drawing Name: \03868\28\38682810.dwg
Operator Name:
Scale: 1"=50'
Dwg Size: 356939 Bytes
Plot Date: February 2003
Plot Time: 07:52.0358 AM
Attached Xref's: No xref's Attached.

RMT COMPUTER AIDED DESIGN AND DRAFTING



SAMPLE OR MONITORING LOCATION AND NUMBER

- MW-21 — MONITORING WELL LOCATION AND NUMBER
- WP-B7 — WELL POINT LOCATION AND NUMBER

LEGEND

- EXCAVATION OF SOILS > 400mg/kg LEAD AROUND BUILDING 14
- GRADING OF SOILS ADJACENT TO ROCKAWAY RIVER.
- SUB-SURFACE SOILS WITHIN THE FORMER DISPOSAL AREA > 400 mg/kg
- EXCAVATION OF CLEAN SOILS OVERLYING FREE PRODUCT IMPACTED SOILS
- EXCAVATION OF PROCESS WASTE AFFECTED SOILS

NOTES

A-2 SOILS ARE PREDOMINATELY <400 mg/kg LEAD BUT WITH SOME ANTICIPATED HOT SPOTS. THESE WILL BE STOCKPILED AND TESTED TO DETERMINE SUITABILITY FOR REUSE.

N

0 50' 100'

SCALE IN FEET

LE CARPENTER
WHARTON, NEW JERSEY

REMEDIAL EXCAVATION PLAN

DRAWN BY:	SJL	PROJECT NUMBER:	3868.34
CHECKED BY:	DD	FILE NUMBER:	38683406.DWG
APPROVED BY:	NC	DATE:	FEBRUARY 2003

RMT INC.
1143 HIGHLAND DRIVE, SUITE B
ANN ARBOR, MI. 48108-2237
PHONE: 734-971-7080
FAX: 734-971-9022

PLOT DATA
Drawing Name: \03868\34\38683406.dwg
Operator Name:
Scale: 50'
Dwg Size: 1671597 Bytes
Plot Date: February 2003
Plot Time: 10:14.4391 AM
Attached Xref's: No xref's Attached.

FIGURE 7

RMT COMPUTER AIDED DESIGN AND DRAFTING

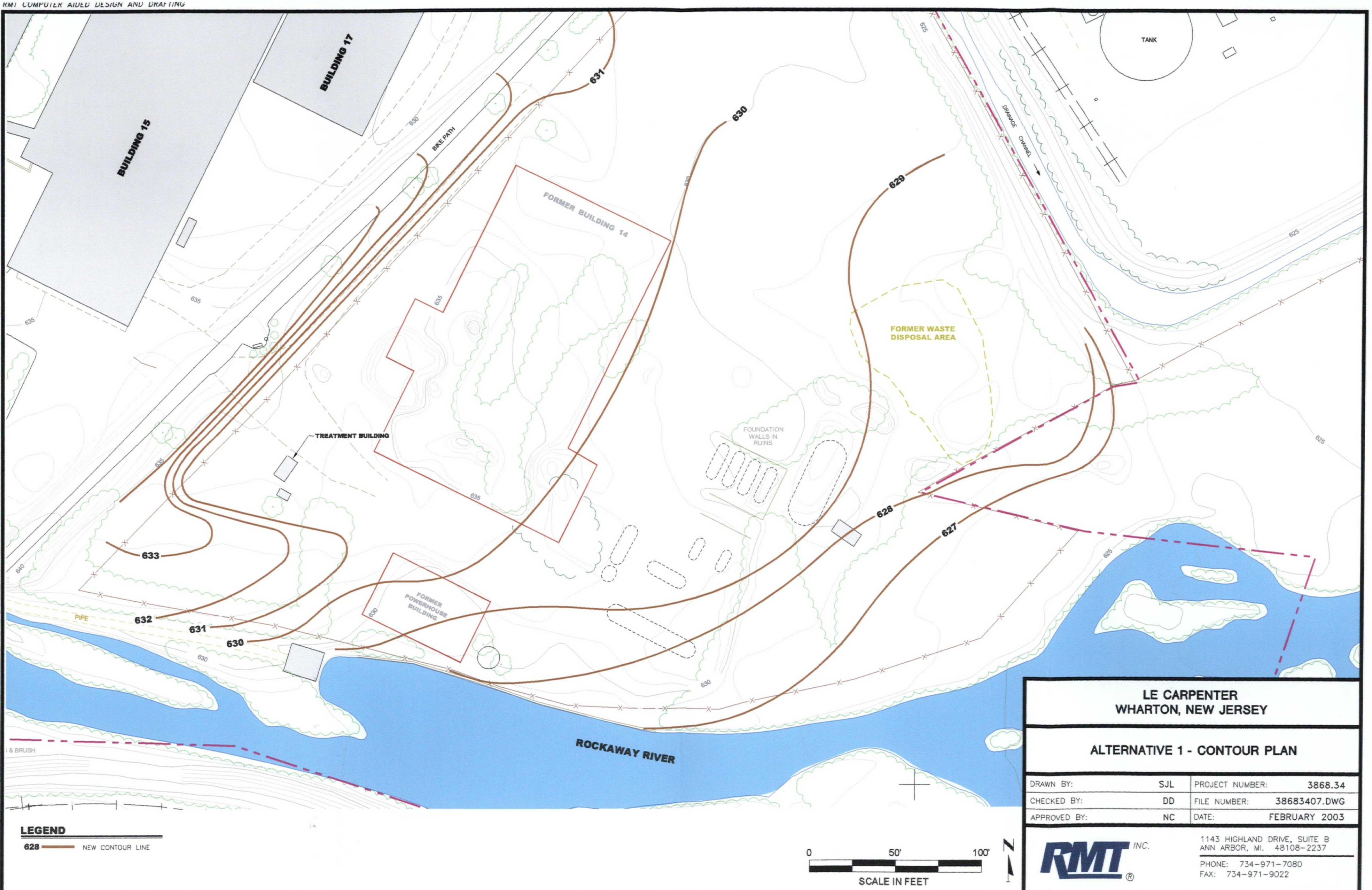
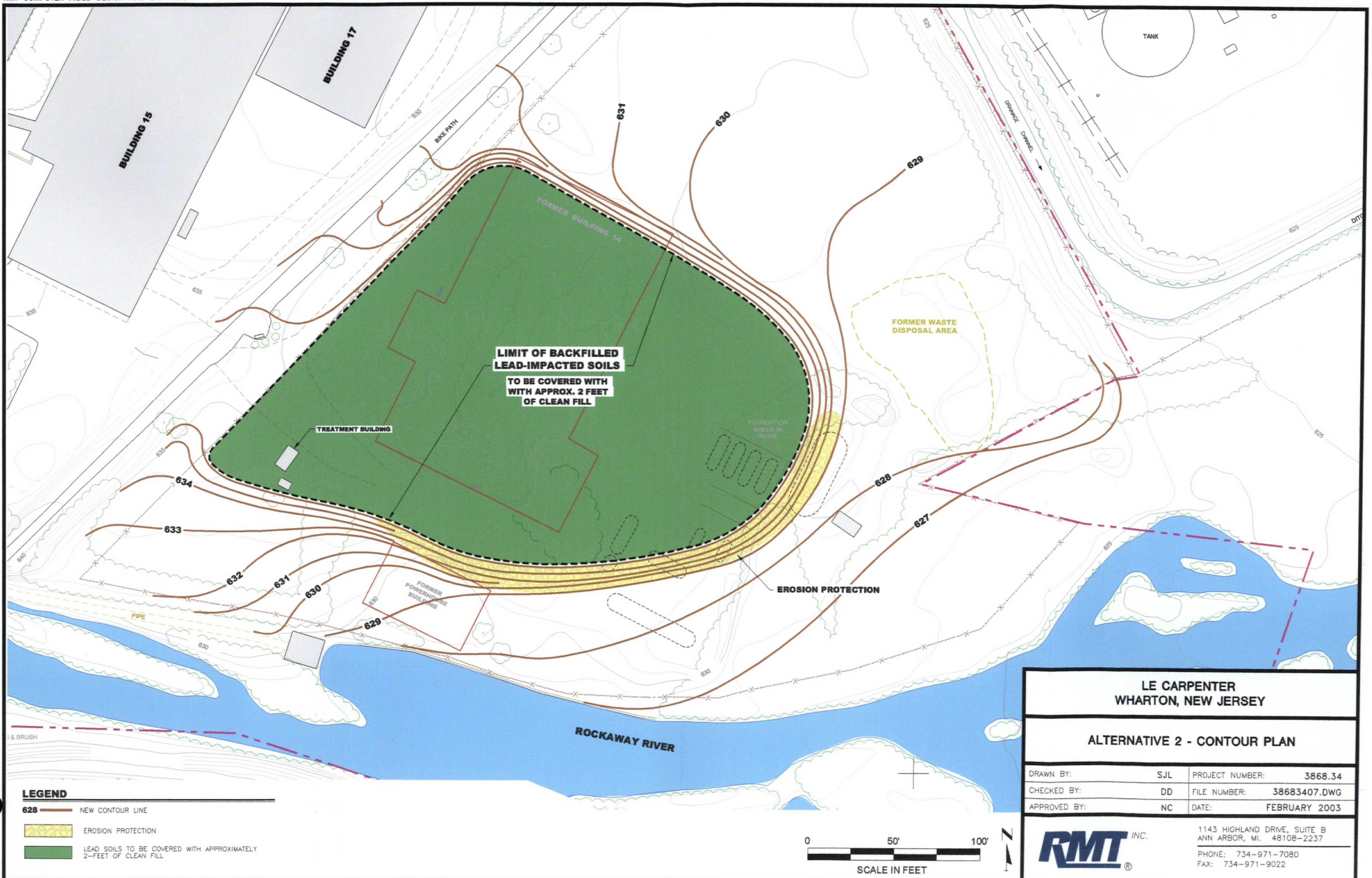


FIGURE 8

PLOT DATA
Drawing Name: \03868\28\38682810.dwg
Operator Name:
Scale: 1"=50'
Dwg Size: 356939 Bytes
Plot Date: February 2003
Plot Time: 07:52:0358 AM
Attached Xref's: No xref's Attached.

RMT COMPUTER AIDED DESIGN AND DRAFTING



PLOT DATA
Drawing Name: ...\03868\28\38682810.dwg
Operator Name: dos
Scale: 50'
Dwg Size: 356939 Bytes
Plot Date: February 18, 2002
Plot Time: 07:52.0358 AM
Attached Xref's: No xref's Attached.

Appendix A
Area B – Process Waste Description

APPENDIX A PHOTOGRAPHIC LOG OF PROCESS WASTES		
Client Name: L.E. Carpenter & Company	**Site Location:** Wharton, New Jersey	**Project No.** 00-03868.84 Lead Soil FFS

Photo No.	**Date:**
1	11/11/01

Process Waste B-1

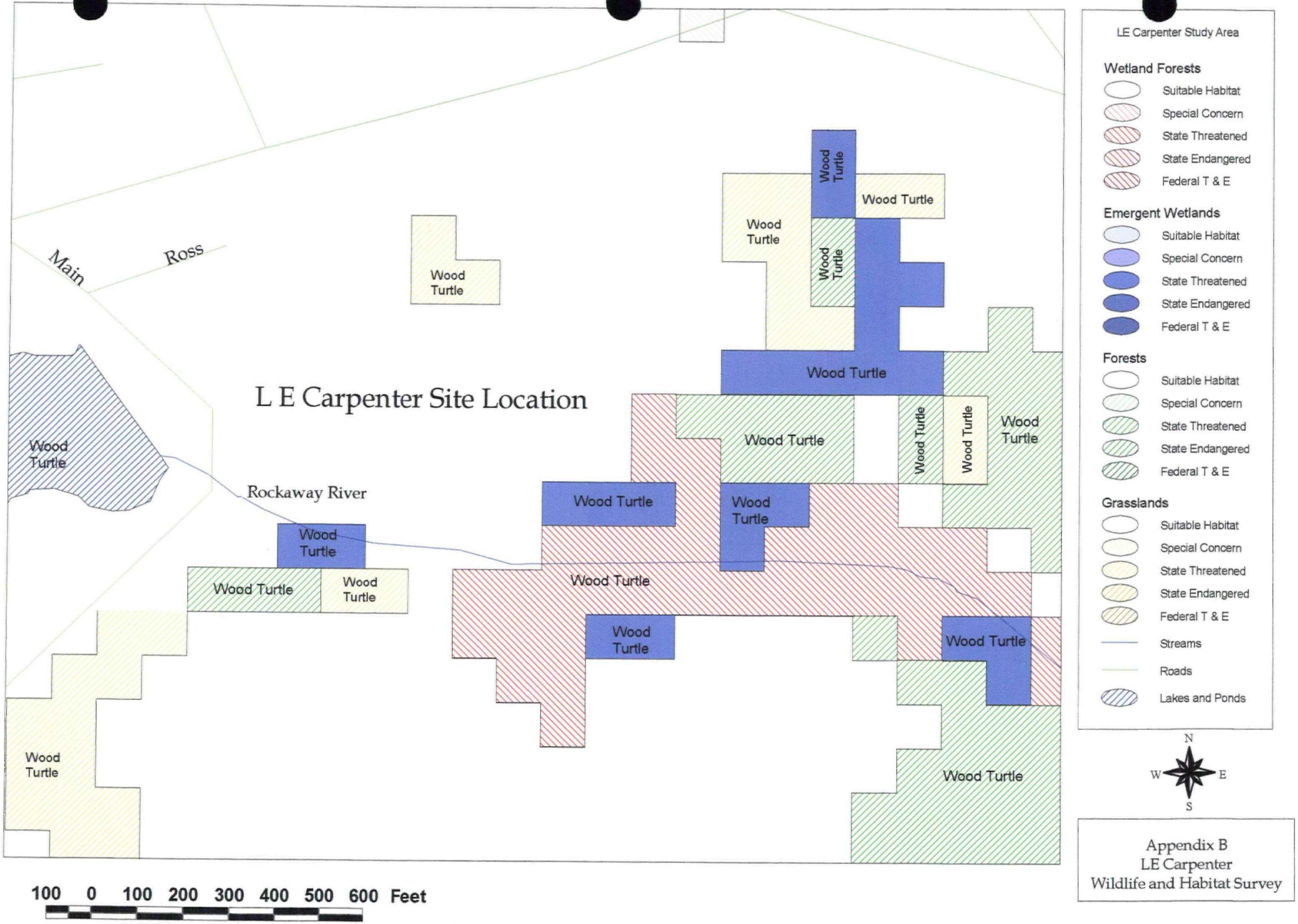
Rainbow colored, putty like material determined to be characteristically hazardous for Lead and Cadmium, and contains elevated organics (Xylenes, DEHP). This waste was discovered in the former tank farm area located to the east of Building 14.

Photo No.	**Date:**
2	11/11/01

Process Waste B-2

Atypical near-surface LEC waste with elevated levels of copper and lead. This material occurs between old powerhouse and penstock outlet over an area approximately 30 x 40 feet.

Appendix B
Environmental Inventory



Appendix B
LE Carpenter
Wildlife and Habitat Survey

RMT, Inc.
February 2003

□1
09 OCT 2001

MORRIS COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK
*** Vertebrates					
ACCIPITER COOPERII	COOPER'S HAWK		T/T		G5
ACCIPITER GENTILIS	NORTHERN GOSHAWK		E/E		G5
AMBYSTOMA LATERALE	BLUE-SPOTTED SALAMANDER		E		G5
AMMODRAMUS SAVANNARUM	GRASSHOPPER SPARROW		T/S		G5
ARDEA HERODIAS	GREAT BLUE HERON		S/S		G5
ASIO OTUS	LONG-EARED OWL		T/T		G5
BARTRAMIA LONGICAUDA	UPLAND SANDPIPER		E		G5
BOTAURUS LENTIGINOSUS	AMERICAN BITTERN		E/S		G4
BUTEO LINEATUS	RED-SHOULDERED HAWK		E/T		G5
CIRCUS CYANEUS	NORTHERN HARRIER		E/U		G5
CISTOTHORUS PLATENSIS	SEDGE WREN		E		G5
CLEMMYS INSCULPTA	WOOD TURTLE		T		G4
CLEMMYS MUHLENBERGII	BOG TURTLE	LT	E		G3
CROTALUS HORRIDUS HORRIDUS	TIMBER RATTLESNAKE		E		G4T4
DOLICHONYX ORYZIVORUS	BOBOLINK		T/T		G5
EURYCEA LONGICAUDA LONGICAUDA	LONGTAIL SALAMANDER		T		G5T5
HALIAEETUS LEUCOCEPHALUS	BALD EAGLE	LT	E		G4
IXOBRYCHUS EXILIS	LEAST BITTERN		D/S		G5
LANIUS LUDOVICIANUS MIGRANS	MIGRANT LOGGERHEAD SHRIKE		E		G5T3Q
LYNX RUFUS	BOBCAT		E		G5
MELANERPES ERYTHROCEPHALUS	RED-HEADED WOODPECKER		T/T		G5
MYOTIS LEIBII	EASTERN SMALL-FOOTED MYOTIS		U		G3
MYOTIS SODALIS	INDIANA BAT	LE	E		G2
NEOTOMA MAGISTER	ALLEGHENY WOODRAT		E		G3G4
PANDION HALIAETUS	OSPREY		T/T		G5
PASSERCULUS SANDWICHENSIS	SAVANNAH SPARROW		T/T		G5
PODILYMBUS PODICEPS	PIED-BILLED GREBE		E/S		G5
STRIX VARIA	BARRED OWL		T/T		G5

*** Ecosystems

□2

MORRIS COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK
BLACK SPRUCE SWAMP	BLACK SPRUCE SWAMP				G4
GLACIAL BOG	GLACIAL BOG				G4?
HARDWOOD-CONIFER SWAMP	HARDWOOD-CONIFER SWAMP				G4?
*** Invertebrates					
AESHNA CLEPSYDRA	MOTTLED DARNER				G4
AESHNA MUTATA	SPATTERDOCK DARNER				G3G4
AESHNA TUBERCULIFERA	BLACK-TIPPED DARNER				G4
ALASMIDONTA HETERODON	DWARF WEDGEMUSSEL	LE	E		G1G2
ALASMIDONTA UNDULATA	TRIANGLE FLOATER				G4
ALASMIDONTA VARICOSA	BROOK FLOATER				G3
AMBLYSCIRTES HEGON	PEPPER AND SALT SKIPPER				G5
ARIGOMPHUS FURCIFER	LILYPAD CLUBTAIL				G5
ATRYTONE AROGOS AROGOS	AROGOS SKIPPER				G3G4T1T
BATTUS PHILENOR	PIPEVINE SWALLOWTAIL				G5
BOLORIA SELENE MYRINA	A SILVER-BORDERED FRITILLARY				G5T5
CELASTRINA NEGLECTAMAJOR	APPALACHIAN BLUE				G4
CHLOSYNE HARRISII	HARRIS' CHECKERSPOT				G4
CHLOSYNE NYCTEIS	SILVERY CHECKERSPOT				G5
CORDULEGASTER ERRONEA	TIGER SPIKETAIL				G4
CORDULEGASTER OBLIQUA	ARROWHEAD SPIKETAIL				G4
ENALLAGMA BASIDENS	DOUBLE-STRIPED BLUET				G5
ENALLAGMA LATERALE	NEW ENGLAND BLUET				G3
ENODIA ANTHEDON	NORTHERN PEARLY EYE				G5
GOMPHUS ROGERSI	SABLE CLUBTAIL				G4
LAMPSILIS RADIATA	EASTERN LAMPMUSSEL				G5
LANTHUS VERNALIS	SOUTHERN PYGMY CLUBTAIL				G4
LYCAENA HYLLUS	BRONZE COPPER				G5
MANDUCA JASMINEARUM	ASH SPHINX				G4

□3
09 OCT 2001

MORRIS COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK
NEONYMPHA MITCHELLII MITCHELLII	MITCHELL'S SATYR	LE	E		G1G2T1T
OPHIOGOMPHUS ASPERSUS	BROOK SNAKETAIL				G3G4
OPHIOGOMPHUS MAINENSIS	MAINE SNAKETAIL				G4
PAPAIPEMA NECOPINA	SUNFLOWER BORER MOTH				G4?
PAPILIO CRESPHONTES	GIANT SWALLOWTAIL				G5
POLITES MYSTIC	LONG DASH				G5
PYRGUS WYANDOT	SOUTHERN GRIZZLED SKIPPER				G2
SATYRIUM ACADICUM	ACADIAN HAIRSTREAK				G5
SATYRIUM EDWARDSII	EDWARDS' HAIRSTREAK				G4
SOMATOCHLORA WALSHII	BRUSH-TIPPED EMERALD				G5
SOMATOCHLORA WILLIAMSONI	WILLIAMSON'S EMERALD				G5
SPEYERIA IDALIA	REGAL FRITILLARY				G3
*** Other types					
BAT HIBERNACULUM	BAT HIBERNACULUM				G?
*** Vascular plants					
ADLUMIA FUNGOSA	CLIMBING FUMITORY				G4
ANDROMEDA GLAUCOPHYLLA	BOG ROSEMARY		E		G5T5
ANGELICA VENENOSA	HAIRY ANGELICA				G5
ARISTOLOCHIA SERPENTARIA	VIRGINIA SNAKEROOT				G4
ASPLENIUM BRADLEYI	BRADLEY'S SPLEENWORT		E		G4
ASPLENIUM MONTANUM	MOUNTAIN SPLEENWORT				G5
ASTER RADULA	LOW ROUGH ASTER		E		G5
BOTRYCHIUM MULTIFIDUM	LEATHERY GRAPE FERN		E		G5
BOTRYCHIUM ONEIDENSE	BLUNT-LOBE GRAPE FERN				G4Q
CALYSTEGIA SPITHAMAEA	ERECT BINDWEED		E		G4G5T4T
CARDAMINE DOUGLASSII	PURPLE BITTERCRESS				G5

RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK
CARDAMINE PRATENSIS VAR PALUSTRIS	MEADOW CUCKOO-FLOWER				G5T5
CAREX BRUNNESCENS	ROUND-SPIKE BROWNISH SEDGE		E		G5T5
CAREX DISPERMA	SOFT-LEAF SEDGE				G5
CAREX HAYDENII	CLOUD SEDGE		E		G5
CAREX LEPTONERVIA	FINE-NERVE SEDGE		E		G4
CAREX LIMOSA	MUD SEDGE		E		G5
CAREX LOUISIANICA	LOUISIANA SEDGE		E		G5
CAREX POLYMORPHA	VARIABLE SEDGE		E		G3
CAREX SICCATA	HILLSIDE SEDGE		E		G5
CAREX TYPHINA	CAT-TAIL SEDGE				G5
CAREX UTRICULATA	BOTTLE-SHAPED SEDGE				G5
CASTILLEJA COCCINEA	SCARLET INDIAN-PAINTBRUSH				G5
CERCIS CANADENSIS	REDBUD		E		G5T5
CLEMATIS OCCIDENTALIS VAR OCCIDENTALIS	PURPLE CLEMATIS				G5T5
CUSCUTA CEPHALANTHI	BUTTONBUSH DODDER		E		G5
DIRCA PALUSTRIS	LEATHERWOOD				G4
EQUISETUM PRATENSE	MEADOW HORSETAIL		E		G5
EQUISETUM VARIEGATUM	VARIEGATED HORSETAIL		E		G5T5
ERIOPHORUM GRACILE	SLENDER COTTON-GRASS		E		G5T?
ERIOPHORUM TENELLUM	ROUGH COTTON-GRASS		E		G5
ERIOPHORUM VAGINATUM VAR SPISSUM	SHEATHED COTTON-GRASS		E		G5T5
GLYCERIA GRANDIS	AMERICAN MANNA GRASS		E		G5T5
GNAPHALIUM MACOUNII	WINGED CUDWEED		E		G5
GYMNOCARPIUM DRYOPTERIS	OAK FERN				G5
HELONIAS BULLATA	SWAMP-PINK	LT	E	LP	G3
HEMICARPHA MICRANTHA	SMALL-FLOWER HALFCHAFF SEDGE		E		G4
HIERACIUM KALMII	CANADA HAWKWEED		E		G5T?

□5
09 OCT 2001

MORRIS COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN

THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK
HOTTONIA INFLATA	FEATHERFOIL		E		G4
ILEX MONTANA	LARGE-LEAF HOLLY		E		G5
KALMIA POLIFOLIA	PALE-LAUREL		E		G5
LEDUM GROENLANDICUM	LABRADOR TEA				G5
LEMNA TRISULCA	STAR DUCKWEED				G5
LILIUM PHILADELPHICUM VAR PHILADELPHICUM	WOOD LILY				G5T4T5
LOBELIA DORTMANNA	WATER LOBELIA		E		G4
LUPINUS PERENNIS	WILD LUPINE				G5
LYCOPODIELLA INUNDATA	NORTHERN BOG CLUB-MOSS				G5
LYCOPODIUM ANNOTINUM	STIFF CLUB-MOSS		E		G5
LYSIMACHIA THYRSIFLORA	TUFTED LOOSESTRIFE				G5
MALAXIS BAYARDII	BAYARD LONG'S ADDER'S-MOUTH		E		G2
MALAXIS UNIFOLIA	GREEN ADDER'S-MOUTH				G5
MELANTHIUM VIRGINICUM	VIRGINIA BUNCHFLOWER		E		G5
MILIUM EFFUSUM	TALL MILLET GRASS		E		G5
MIMULUS ALATUS	WINGED MONKEY-FLOWER				G5
MYRIOPHYLLUM VERTICILLATUM	WHORLED WATER-MILFOIL		E		G5
NUPHAR MICROPHYLLUM	SMALL YELLOW POND-LILY		E		G5T4T5
NYMPHOIDES CORDATA	FLOATINGHEART			LP	G5
OBOLARIA VIRGINICA	VIRGINIA PENNYWORT				G5
PANICUM BOREALE	NORTHERN PANIC GRASS		E		G5
PHEGOPTERIS CONNECTILIS	NORTHERN BEECH FERN				G5
PHLOX PILOSA	DOWNY PHLOX		E		G5T5
PLATANTHERA HOOKERI	HOOKER'S ORCHID		E		G5
PLATANTHERA PSYCODES	PURPLE FRINGED ORCHID				G5
POTAMOGETON ALPINUS	NORTHERN PONDWEED		E		G5
POTAMOGETON ILLINOENSIS	ILLINOIS PONDWEED		E		G5
POTAMOGETON OBTUSIFOLIUS	BLUNT-LEAF PONDWEED		E		G5
POTAMOGETON ROBBINSII	ROBBIN'S PONDWEED		E		G5

□6
09 OCT 2001

MORRIS COUNTY
RARE SPECIES AND NATURAL COMMUNITIES PRESENTLY RECORDED IN
THE NEW JERSEY NATURAL HERITAGE DATABASE

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK
POTAMOGETON ZOSTERIFORMIS	EEL-GRASS PONDWEED		E		G5
POTENTILLA ARGUTA VAR ARGUTA	TALL CINQUEFOIL				G5T?
POTENTILLA PALUSTRIS	MARSH CINQUEFOIL		E		G5
PRENANTHES RACEMOSA	SMOOTH RATTLESNAKE-ROOT		E		G5T?
PRUNUS ALLEGHANIENSIS	ALLEGHENY PLUM		E		G4T4
PRUNUS PUMILA VAR DEPRESSA	LOW SAND CHERRY				G5T5
PYCNANTHEMUM TORREI	TORREY'S MOUNTAIN-MINT		E		G2
RANUNCULUS AMBIGENS	WATER-PLANTAIN SPEARWORT				G4
RANUNCULUS FASCICULARIS	EARLY BUTTERCUP		E		G5
RANUNCULUS PUSILLUS VAR PUSILLUS	LOW SPEARWORT				G5T4?
RHODODENDRON CANADENSE	RHODORA		E		G5
SALIX LUCIDA SSP LUCIDA	SHINING WILLOW				G5T5
SALIX PEDICELLARIS	BOG WILLOW		E		G5
SCHEUCHZERIA PALUSTRIS	ARROW-GRASS		E		G5T5
SMILACINA TRIFOLIA	THREE-LEAF FALSE SOLOMON'S-SEAL		E		G5
SOLIDAGO RIGIDA	PRAIRIE GOLDENROD		E		G5T5
SPARGANIUM ANGUSTIFOLIUM	NARROW-LEAF BURR-REED		E		G5
SPARGANIUM MINIMUM	SMALL BURR-REED		E		G5
SPOROBOLUS NEGLECTUS	SMALL RUSH-GRASS		E		G5
STELLARIA BOREALIS	BOREAL STARWORT		E		G5T5
TIARELLA CORDIFOLIA	FOAMFLOWER		E		G5T5
TRIADENUM FRASERI	FRASER'S ST. JOHN'S-WORT				G4G5
TRIPHORA TRIANTHOPHORA	THREE BIRDS ORCHID		E		G3G4
TROLLIUS LAXUS SSP LAXUS	SPREADING GLOBE FLOWER		E		G4T3
UTRICULARIA INTERMEDIA	FLAT-LEAF BLADDERWORT				G5
UTRICULARIA PURPUREA	PURPLE BLADDERWORT			LP	G5
VERBENA SIMPLEX	NARROW-LEAF VERVAIN		E		G5

NAME	COMMON NAME	FEDERAL STATUS	STATE STATUS	REGIONAL STATUS	GRANK
VIOLA BLANDA VAR PALUSTRIFORMIS	LARGE-LEAF WHITE VIOLET				G4G5T4T
VIOLA CANADENSIS	CANADIAN VIOLET		E		G5T?

164 Records Processed

New Jersey Division of Fish and Wildlife

Conserve Wildlife

N.J. Division of Fish & Wildlife
Endangered & Nongame Species Program

Endangered and Threatened Wildlife of New Jersey

Endangered Species are those whose prospects for survival in New Jersey are in immediate danger because of a loss or change in habitat, over-exploitation, predation, competition, disease, disturbance or contamination. Assistance is needed to prevent future extinction in New Jersey.

Threatened Species are those who may become endangered if conditions surrounding them begin to or continue to deteriorate.

Species names link to PDF documents containing identification, habitat, and status and conservation information. Use the Adobe Acrobat Reader to view and print these documents. The Reader is available free from Adobe's Web site.

BIRDS			
Endangered		Threatened	
Bittern, American	*Botaurus lentiginosos* BR	Bobolink	*Dolichonyx oryzivorus* BR
Eagle, bald	*Haliaeetus leucocephalus* BR **	Eagle, bald	*Haliaeetus leucocephalus* NB **
Falcon, peregrine	*Falco peregrinus*	Hawk, Cooper's	*Accipiter cooperii*
Goshawk, northern	*Accipiter gentilis* BR	Hawk, red-shouldered	*Buteo lineatus* NB
Grebe, pied-billed	*Podilymbus podiceps**	Night-heron, black-crowned	*Nycticorax nycticorax* BR
Harrier, northern	*Circus cyaneus* BR	Night-heron, yellow-crowned	*Nyctanassa violaceus*
Hawk, red-shouldered	*Buteo lineatus* BR	Knot, red	*Calidris canutus* BR
Owl, short-eared	*Asio flammeus* BR	Osprey	*Pandion haliaetus* BR
Plover, piping	*Charadrius melodus***	Owl, barred	*Strix varia*

Sandpiper, upland	*Batramia longicauda*	Owl, long-eared	*Asio otus*
Shrike, loggerhead	*Lanius ludovicianus*	Rail, black	*Laterallus jamaicensis*
Skimmer, black	*Rynchops niger* BR	Skimmer, black	*Rynchops niger* NB
Sparrow, Henslow's	*Ammodramus henslowii*	Sparrow, grasshopper	*Ammodramus savannarum* BR
Sparrow, vesper	*Pooecetes gramineus* BR	Sparrow, Savannah	*Passerculus sandwichensis* BR
Tern, least	*Sterna antillarum*	Sparrow, vesper	*Pooecetes gramineus* NB
Tern, roseate	*Sterna dougallii***	Woodpecker, red-headed	*Melanerpes erythrocephalus*
Wren, sedge	*Cistothorus platensis*		

**Federally endangered or threatened

BR - Breeding population only; NB - non-breeding population only

REPTILES			
Endangered		**Threatened**	
Rattlesnake, timber	*Crotalus h. horridus*	Snake, northern	*Pituophis m. melanoleucus*
Snake, corn	*Elaphe g. guttata*	Turtle, Atlantic green	*Chelonia mydas***
Turtle, bog	*Clemmys muhlenbergii***	Turtle, wood	*Clemmys insculpta*
Atlantic hawksbill	*Eretmochelys imbricata***		
Atlantic	*Dermochelys coriacea***		
Atlantic loggerhead	*Caretta caretta***		
Atlantic Ridley	*Lepidochelys kempi***		

**Federally endangered or threatened

AMPHIBIANS

Endangered		Threatened	
Salamander, blue-spotted	*Ambystoma laterale*	Salamander, eastern	*Pseudotriton montanus*
Salamander, eastern	*Ambystoma tigrinum*	Salamander, long-tailed	*Eurycea longicauda*
Salamander, Tremblay's	*Ambystoma tremblayi*		
Treefrog, pine barrens	*Hyla andersonii*		
Treefrog, southern gray	*Hyla chrysocelis*		

INVERTEBRATES			
Endangered		**Threatened**	
Beetle, American burying	*Nicrophorus mericanus***	Elfin, frosted (butterfly)	*Callophrys irus*
Beetle, northeastern beach tiger	*Cincindela d. dorsalis***	Floater, triangle (mussel)	*Alasmidonta undulata*
Copper, bronze	*Lycaena hyllus*	Fritillary, silver-bordered (butterfly)	*Bolaria selene myrina*
Floater, brook (mussel)	*Alasmidonta varicosa*	Lampmussel, eastern (mussel)	*Lampsilis radiata*
Floater, green (mussel)	*Lasmigona subviridis*	Lampmussel, yellow (mussel)	*Lampsilis cariosa*
Mussel, dwarf wedge	*Alasmidonta heterodon***	Mucket, tidewater (mussel)	*Leptodea ochracea*
Satyr, Mitchell's (butterfly)	*Neonympha m. mitchellii***	Pondmussel, eastern (mussel)	*Ligumia nasuta*
Skipper, arogos (butterfly)	*Atrytone arogos arogos*	White, checkered (butterfly)	*Pontia protodice*
Skipper, Appalachian grizzled (butterfly)	*Pyrgus wyandot*		
**Federally endangered or threatened			

MAMMALS	
Endangered	
Bat, Indiana	*Myotis sodalis***
Bobcat	*Lynx rufus*
Whale, black right	*Balaena glacialis***
Whale, blue	*Balaenoptera musculus***
Whale, fin	*Balaenoptera physalus***
Whale, humpback	*Megaptera novaeangliae***
Whale, sei	*Balaenoptera borealis***
Whale,sperm	*Physeter macrocephalus***
Woodrat, Allegheny	*Neotoma floridana magister*
**Federally Endangered	

FISH	
Endangered	
Sturgeon,	*Acipenser*
**Federally Endangered	

List updated 9/12/02

The lists of New Jersey's endangered and nongame wildlife species are maintained by the DEP's Division of Fish and Wildlife's Endangered and Species Program. These lists are used to determine protection and management actions necessary to ensure the survival of the state's endangered and nongame wildlife. This work is made possible through voluntary contributions received through Check-off donations to the Endangered Wildlife Conservation Fund on the New Jersey State Income Tax Form, the sale of Conserve Wildlife License Plates, and donations. For more information about the Endangered and Nongame Species Program or to report a sighting of endangered or threatened wildlife, contact the Endangered and Nongame

Wood Turtle, *Clemmys insculpta*

Status: ***State:*** Threatened ***Federal:*** Not listed

Identification

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As the taxonomic name insculpta indicates, the wood turtle is distinguished by the sculpted or grooved appearance of its carapace, or upper shell. Each season a new annulus, or ridge, is formed, giving each scute (a scale-like horny layer) a distinctive pyramid-shaped appearance. As the turtle ages, natural wear smoothes the surface of the shell. While the scutes of the carapace are brown, the plastron, or underneath shell, consists of yellow scutes with brown or black blotches on each outer edge. The legs and throat are reddish-orange. The male wood turtle has a concave plastron while that of the female is flat or convex. The male also has a thicker tail than the female. Adult wood turtles measure 14 to 20 cm (5.5 to 8.0 in.) in length (Conant and Collins 1991).

Habitat

Unlike other turtle species that favor either land or water, the wood turtle resides in both aquatic and terrestrial environments. Aquatic habitats are required for mating, feeding, and hibernation, while terrestrial habitats are used for egg laying and foraging. Freshwater streams, brooks, creeks, or rivers that are relatively remote provide the habitat needed by these turtles. Consequently, wood turtles are often found within streams containing native brook trout (Salvelinus fontinalis). These tributaries are characteristically clean, free of litter and pollutants, and occur within undisturbed uplands such as fields, meadows, or forests. Open fields and thickets of alder (Alnus spp.), greenbrier (Smilax spp.), or multiflora rose (Rosa multiflora) are favored basking habitats. Lowland, mid-successional forests dominated by oaks (Quercus spp.), black birch (Betula lenta), and red maple (Acer rubrum) may also be used. Wood turtles may also be found on abandoned railroad beds or agricultural fields and pastures. Nevertheless, wood turtle habitats typically contain few roads and are often over one-half of a mile away from developed or populated areas (Zappalorti et al. 1984). Individuals from relict or declining populations are also sighted in areas of formally good habitat that have been fragmented by roads and development.

Status and Conservation

Historically, the wood turtle was a fairly common species within suitable habitat in New Jersey. By the 1970s, however, declines were noted as wood turtles were absent from many historic sites due to habitat loss and stream degradation. Consequently, the wood turtle was listed as a threatened species in New Jersey in 1979. The New Jersey Natural Heritage Program considers the wood turtle to be "demonstrably secure globally," yet "rare in New Jersey" (Office of Natural Lands Management 1992).

Since the late 1970s, biologists have monitored and surveyed wood turtle sites in New Jersey, providing valuable data regarding the life history, reproduction, and habitat use of these turtles in the state. There is, however, a continuing need to examine the productivity and juvenile survival of wood turtles, which may be threatened by disturbance or predation.

In 1995, the wood turtle was proposed for inclusion on the federal endangered species list. Despite declines in several northeastern states, populations were considered stable enough throughout the species' entire range to deny listing. However, the wood turtle was considered by the U.S. Fish and Wildlife Service as a species that, "although not necessarily now threatened with extinction may become so unless trade in them is strictly controlled" (U.S. Fish and Wildlife Service 1995). As a result, international trade of these turtles is strictly monitored and regulated through the CITES Act (Convention on International Trade in Endangered Species of Wild Flora and Fauna Act). The New Jersey Endangered Species Act prohibits the collection or possession of wood turtles.

Appendix C
Quantity Analysis

APPENDIX C-1

LEC - ALTERNATIVE 2 BACKFILL AND FINAL GRADE COMPUTATIONS							
Free Product Zone Excavation		% Coarse	P/Area	Sq Feet	Total Thickness Ft	FT 3	CY
	B-14	60	10.14	25,350	8	202,800	7,511
	East	40	8.1	20,250	8	162,000	6,000
			Total	45,600	Square Feet		13,511
Less Clean Overburden Stockpiled soils put back in excavation (top 2 ft)				3378	CY		10,133
Less Coarse Fraction Left in place (product zone)				5180	CY	**CY of Void**	**4,953**
Calculate Elevation of FP-Excavation after Use of Clean Overburden Stockpile and Coarse Fraction Left in Place							
Top of FP excavation at elev 630, base at 622							
			CY of void remaining to reach original excavation elev. 630 MSL				4,953
			CF of void remaining				133,734
			Depth of void (CF/Area) = (133,734 CF/45,600 SF)				2.93
			Void elevation after clean stockpiled soil used (630 ft MSL-2.93 ft)				**627.07**
Calculate minimum volume of imported soil to backfill excavation to elev 629 (1.5 above seasonal high water table)							
						Feet	1.93
						Volume (CF)	88,134
						Volume (CY)	**3,264**
Calculate Stockpiled Soils(>400 ppm lead) needed to backfill remaining 45,600 sf void to base elevation 630							
						Feet	1
						Volume (CF)	45,600
						Volume (CY)	**1,689**
Calculate remaining volume in >400 ppm lead-impacted soil stockpile							
						Stockpiled	10,190
				Less volume To base elev. 630		Used	1,689
				Remaining soil stockpiled		CY	**8,501**
Spread Remaining Lead-Impacted Soil on Design Area to be Capped (60,920 SF)							
			Thickness =	(8,501 cy spread over a 60,920 sq ft area)		FT	**3.77**
		Pre-Final Elevation = 630 + 3.77 = ~634					
Add 2 feet of protective cover to lead-impacted soil terrace							
						FT	2
						Area (sq ft)	60,920
Final grade elevation = 634 MSL + 2 feet of Clean Cover = ~ 636 MSL						CF	121,840
				Total Protective Cover		CY	**4,513**
Total Backfill to import for cover and water-table separation							
(3,264 + 4,513 CY)						**Total Clean Fill Required**	**7,777**

Other Elements

Shoreline Restoration		
Topsoil 6 inch	CY	723
Seed Mulch	SF	39,020
Parking Lot Restoration		
Asphalt Removal	SF	35,000
Topsoil 6 inch	CY	648
Seed/Mulch	SF	35,000
Perimeter Fence	LF	1,800
Shore Erosion Controls	LF	450

APPENDIX C-2

LEC Remedial Excavation, Stockpile and Disposal Quantities

	Planimetered Area				Excavation Volume	Alternative 2 Stockpile for reuse: Lead Contaminated	Alternative 2 Stockpile for reuse: Clean	Alternative 1 Dispose Off-Site: Hazardous	Alternative 1 Dispose Off-Site: > 400 mg/kg Lead Off-Site Disposal
Rockaway River Shoreline Area (A-2)									
(Stockpile for Reuse)	P/Area	Sq Feet	Thick	Ft3	IPCY				
	13.1	32,750	1	32,750					
	1.07	2,675	2	5,350					
	0.53	1,325	1	1,325					
	1.03	2,575	3	7,725					
	0.75	1,875	4	7,500	0				
				54,650	2,024	2,024			2,024
Building 14 Area (Area A-1)									
(Stockpile for reuse)	22.4	56,000	1	56,000					
	13.78	34,450	2	68,900					
	8.43	21,075	1	21,075					
	2.88	7,200	2	14,400					
	7.82	19,550	2	39,100					
				199,475	7,388	7,388			7,388
Haz. Process Waste Soils (B-1)									
	2.8	7,000	6	42,000	1,556	778		778	778
(Off-site Disposal)	Assume 50% Contaminated - Remainder to TSD								
TOTAL LEAD CONTAMINATED SOIL STOCKPILED FOR REUSE (ALTERNATIVE 2)						10,190		**ALTERNATIVE 1**	10,190

Free Product Zone		% Coarse	P/Area	Sq Feet	Total Thickness Ft	FT 3	CY		2 ft = Clean		Product Contaminated Soil Zone @ 6 ft thick	Screened for off-site disposal	Coarse fraction left in excavation
						Excavation Volume (In-Place)							
	B-14	60	10.14	25,350	8	202,800	7,511		1,878		5,633	2,253	3,380
	East	40	8.1	20,250	8	162,000	6,000		1,500		4,500	2,700	1,800
	Total Excavation - Product Zone						13,511			Total	10,133		
	Total Stockpile Volume from Product Zone (2 feet = clean)								3,378				
	Screened Coarse Fraction Left in Excavation - Product zone								5,180				
	Total Salvaged non-lead contaminated Backfill								8,558				
	Total Off-site Volume disposed from product zone											4,953	5,180
GRAND TOTAL EXCAVATED							24,479						

APPENDIX C-3

LEC - BACKFILL AND FINAL GRADE COMPUTATIONS	ALTERNATIVE 2 ON-SITE REUSE		ALTERNATIVE 1 OFF-SITE DISPOSAL	
	Use or Import	Dispose	Use or Import	Dispose
1. Grade and stockpile soil adjacent to Rockaway River (Area A-2, Category A Soils)	2,024			2,024
2. Remove and stockpile >400 ppm lead contaminated soil from Vicinity of Building B-14 to elevation 630 (Area A-1, Category A Soils)	7,388			7,388
3. Excavate and segregate soils from Process waste area to elevation ~ 624, assume 50% for TSD disposal (Area B-1 and B-2, Category B Soils), Rest goes to >400 Stockpile (50%) (Category A Soils)	778	778		1,556
4. Excavate ~ first 2 feet of soils (~ elev 628) overlying FP zone at Building 14 Area, and stockpile as clean backfill (AreaC-1, Category C Soils)	1,878		1,878	
5. Excavate ~ first 2 feet of soil (~628) overlying Free Product zone east of Building 14 (Area C-2, Category C Soils	1,500		1,500	
6. Excavate product saturated soil from Area of Building 14, assume 40% is removed for offsite disposal and 60% stays in Excavation	3,380	2,253	3,380	2,253
7. Excavate product Saturated Soil from area east of Building 14, assume 60% is removed for off-site disposal and 40% is stock piled.	1,800	2,700	1,800	2,700
8. Backfill FP excavation with clean Stockpiled soil (Category C Soils)	(3,380)		(3,380)	
9. Backfill to 1.5 ft above water table with imported backfill (to elev ~ 629)	(3,264)		(3,264)	
10. Replace stockpiled >400ppm soil in excavation areas planned for capping	(10,175)			
11. Install two feet of cover material	(4,513)			

Notes

Numbers in parentheses ( ) represent backfill materials